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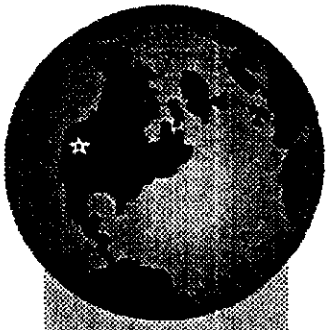
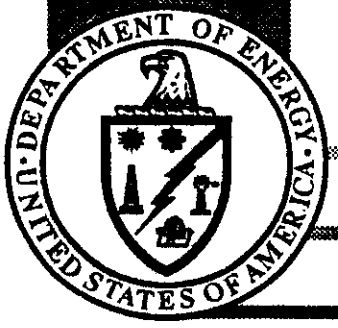


INEL
Idaho National Engineering Laboratory
Environmental
Restoration

Background Concentrations of Selected Metals and Radionuclides in the Big Lost River Alluvium at the Idaho Chemical Processing Plant



Westinghouse Idaho
Nuclear Company, Inc.

Idaho National Engineering Laboratory

U.S. Department of Energy, Idaho Field Office

EXECUTIVE SUMMARY

The Idaho Chemical Processing Plant (ICPP) background investigation was intended to determine the concentrations of a selected list of naturally occurring metals and radionuclides in the alluvium above the basalt at the ICPP. This data would then be used during future environmental investigations performed under the Federal Facilities Agreement/Consent Order (FFA/CO) to: a) allow site-related contamination to be differentiated from naturally occurring background levels, b) reduce the uncertainties in determining the risks associated with low probability hazard sites, and c) more accurately estimate the incremental risks posed to human health as a result of past site practices.

The target analyte list for this investigation was based on the composition of the high-level liquid waste and includes only those analytes normally present in soils at trace concentrations or may be present due to large scale testing (i.e., above ground testing of nuclear weapons). The metals targeted for analysis include Arsenic, Barium, Cadmium, Chromium, Lead, Manganese, Mercury, Nickel, Selenium, and Silver. All these metals are present in normal soils at trace amounts and many are also present in the waste stream at the ICPP. The radioactive parameters targeted for analysis include gross-α, gross-β, and gamma isotopic analysis using spectrometric techniques. Alpha and beta emissions result naturally from the decay of radionuclides in the uranium, thorium, and actinium decay series. Gamma isotopic analysis was performed primarily to determine the background concentrations of Cesium-137. Cesium-137 is not naturally occurring, but generally has a widespread occurrence due to the past global practice of above ground testing of nuclear weapons.

To determine the appropriate background concentrations for the ICPP, the investigative depth for the boreholes was selected to be the upper 20 ft of alluvium. This depth was based on the majority of the alluvium at the ICPP being disturbed by construction activities to a depth of 8 ft, and locally to the top of basalt. Due to this mixing of the alluvium, background concentrations from the upper 20 ft should provide a more representative concentration for the disturbed areas within the ICPP.

The results of the data validation are summarized in Section 2.2.3. Three of the metals (Pb, Mn, and Se) contained poor matrix spike recoveries, and the data were determined unusable for background concentrations. Arsenic, Ag, Cs-137, and gross-α reportedly had low matrix spike recoveries in a single sample delivery group (SDG), indicating a possibility the concentrations are underestimated. However, these concentrations were qualified as useable values (i.e., "J" flagged) during data validation and were used in the background evaluation. The reported concentrations for four of the metals

(Hg, Cd, Se, and Ag) were reported below the method detection limit and no statistical analyses were performed on these metals. The remaining metals (Ba, Cr, and Ni) and gross-β concentrations were not qualified during data validation and are available for unrestricted use.

According to the Geologic Borehole Logs (provided in Appendix A), soil samples were collected from similar geologic materials (sand and gravel) for all samples except two. These two samples were collected from background location #6 and reported as a very fine grained sand or silt [Unified Soil Classification System (USCG classification ML)]. However, the detected metal and radionuclide concentrations from these samples are consistent with the concentrations from the other samples and as a result, all samples were treated in the statistical analysis as originating from the same geologic material.

To determine whether the metal and radionuclide concentrations vary with depth, a t-test was performed on the different sample depths. These results indicate only the Ba concentrations significantly vary with depth. None of the other metals or radionuclides indicated a consistent trend in vertical concentration gradients and, as such, the background means, 95th Upper Confidence Level (UCLs), and 95th Upper Tolerance Limits (UTLs) were reported as a single sample population.

A W-test was performed on the data to determine whether the distribution could be better approximated using a normal or lognormal model. Results from this tests determined the data distribution is not statistically (to a 95% confidence limit) modeled by either of these distributions. Even though these two distribution models may not statistically represent the existing data, they are the most commonly used models for environmental data and probably provide the most reasonable estimates for the background evaluation. Therefore, these two distribution models were applied to the data set to determine the concentrations for mean, 95th UCL, and 95th UTL.

The selection of the more appropriate distribution model (normal vs lognormal) for the data set is unclear based on the results from the W-test and histograms. According to Gilbert (1987), however, "the lognormal distribution is the most commonly used probability density model for environmental contaminant data." Therefore, the background concentrations recommended for comparison to other ICPP contaminant concentrations are the 95th UTL based on the lognormal distribution. The appropriate background concentrations for the alluvium at the ICPP determined by this study are:

Constituent	Concentration (95th UTL)
Arsenic	13.5 mg/kg
Barium	335 mg/kg
Chromium	52 mg/kg
Nickel	42 mg/kg
Gross-α	23 pCi/g
Gross-β	33 pCi/g
Cs-137	1.1 pCi/g
K-40	25 pCi/g

A comparison was performed between metal and radionuclide background concentrations presented in this report and background concentrations reported in previously published studies for locations within the Idaho National Engineering Laboratory (INEL). The comparison indicated the background concentrations measured for the ICPP were slightly lower or consistent with metal and radionuclide concentrations present in other published reports. The lower values are attributed to lower matrix spike recoveries, which tend to underestimate concentrations. The ICPP gross-α and gross-β 95th UTLs of 23 pCi/g and 33 pCi/g, respectively, are in good agreement with the screening level of 20 pCi/g for gross-α and 30 pCi/g for gross-β used in previous environmental investigations.

In summary, sampling from soils at the ICPP produced useable background concentrations for selected metals and radionuclides. All background metal and radionuclide concentrations, except Cs-137, were calculated based on a lognormal model of the data. For Cs-137, concentrations were determined based on a normal model of the data because data transformations resulted in unreasonably high values calculated for the UCL and UTL. The calculated background concentrations are consistent with published INEL background levels and suitable for use in risk assessments and remedial action determinations.

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ACRONYMS AND ABBREVIATIONS

Ag	silver
As	arsenic
ASTM	American Society of Testing and Materials
B&W	Babcock and Wilcox
Ba	barium
bgs	below ground surface
Cd	cadmium
CFA	Central Facilities Area
CLP	Contract Laboratory Program
COC	chain-of-custody
Cpm	counts per minute
Cr	chromium
Cs	cesium
CSWP	Construction Safe Work Permit
CY	calendar year
DQO	data quality objective
ECA	Environmentally Controlled Areas
EPA	Environmental Protection Agency
ER	environmental restoration
FFA/CO	Federal Facilities Agreement/Consent Order
FS	feasibility study
FSP	field sampling plan
Gd	gadolinium
Hf	hafnium
Hg	mercury
HPT	health physics technician
HSP	health and safety plan
HWP	Hazardous Work Permit
ICPP	Idaho Chemical Processing Plant
ID	inside diameter
IDHW	Idaho Department of Health and Welfare
INEL	Idaho National Engineering Laboratory
K	potassium
LCL	lower confidence limit
MDL	method detection limit
Mn	manganese
Nd	neodymium
Ni	nickel
NRF	Naval Reactor Facility
OD	outside diameter
OU	operable unit
PA&C	precision, accuracy, and completeness
Pb	lead
PBF	Power Burst Facility
Pt	platinum
QAPjP	quality assurance project plan
QA/QC	quality assurance/quality control
RI	remedial investigation
RPD	relative percent difference
RSD	relative standard difference
RWCP	Radiation Work Control Procedure
RWMC	Radioactive Waste Management Complex

RWP	Radiological Work Permit
SAP	sampling and analysis plan
SDG	sample delivery group
Se	selenium
SMO	Sample Management Office
Sn	tin
TCT	Twin Cities Testing
TRA	Test Reactor Area
UCL	Upper Confidence Level
USCS	Unified Soil Classification System
UTL	Upper Tolerance Limits
UURI	University of Utah Research Institute
WAG	Waste Area Group
WINCO	Westinghouse Idaho Nuclear Company

1.0 INTRODUCTION

This report describes the results from the calendar year (CY) 1992 investigation to characterize background concentrations of selected metals and radionuclides in the unconsolidated alluvium above the basalt at the Idaho Chemical Processing Plant (ICPP). Specifically, naturally-occurring concentrations were established for arsenic (As), barium (Ba), cadmium (Cd), chromium (Cr), mercury (Hg), manganese (Mn), nickel (Ni), lead (Pb), selenium (Se), silver (Ag), cesium-137 (Cs-137), potassium-40 (K-40), gross alpha (gross-α), and gross beta (gross-β). The investigation was implemented under the Federal Facilities Agreement/Consent Order (FFA/CO) to provide site-specific information on the distribution of these elements to aid in risk assessment and remedial action determinations for the ICPP at the Idaho National Engineering Laboratory (INEL).

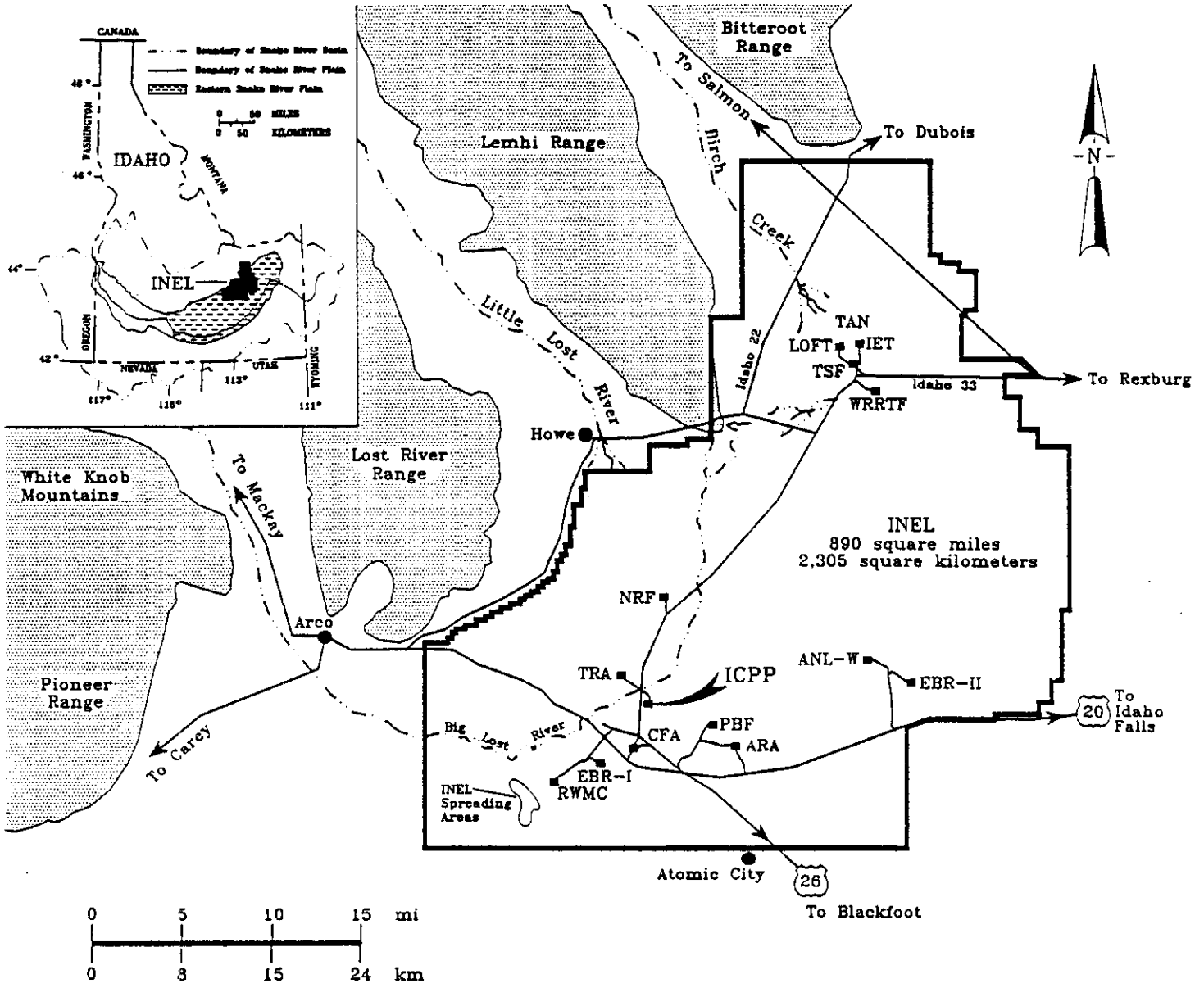
The INEL has been divided into 10 Waste Areas Groups (WAGs) for the purposes of environmental cleanup (FFA/CO, 1991). The ICPP, currently operated by Westinghouse Idaho Nuclear Company (WINCO), has been designated as WAG 3 (Figure 1-1). WAG 3 consists of 13 individual operable units (OUs) containing 83 Environmentally Controlled Areas (ECAs). Each ECA constitutes a separate uncontrolled release or discovery of hazardous and/or radioactive contamination. The background concentrations determined from this investigation will be used to aid in assessing the extent of contamination and incremental risk associated with the release of hazardous and/or radioactive contamination from these sites. As such, the boreholes to determine the background concentrations are located outside the ICPP security perimeter fence, in undisturbed areas having a high likelihood of no anthropogenic contamination (Figure 1-2).

This report provides a discussion of the data quality objectives (DQOs) for the background investigation, summarizes the field investigation and analytical data validation, evaluates the data using standard statistical techniques, and compares the results from this investigation to other similar studies performed at the INEL.

1.1 General Geology

The ICPP is located in the southern portion of the INEL that covers approximately 890 mi^2 of the eastern Snake River Plain in southeastern Idaho (Figure 1-1). The Plain is a structural and topographic basin approximately 200 mi long and 50 to 70 mi wide. Surficial sediments range from 0 to 345 ft thick at the INEL. Underlying these sediments are 2,000 to 10,000 ft of basalt flows, rhyolitic rocks, and tephra, with interbedded alluvium and lacustrine deposits.

Figure 1-1. Map of the INEL showing the location of the ICPP.



EXPLANATION

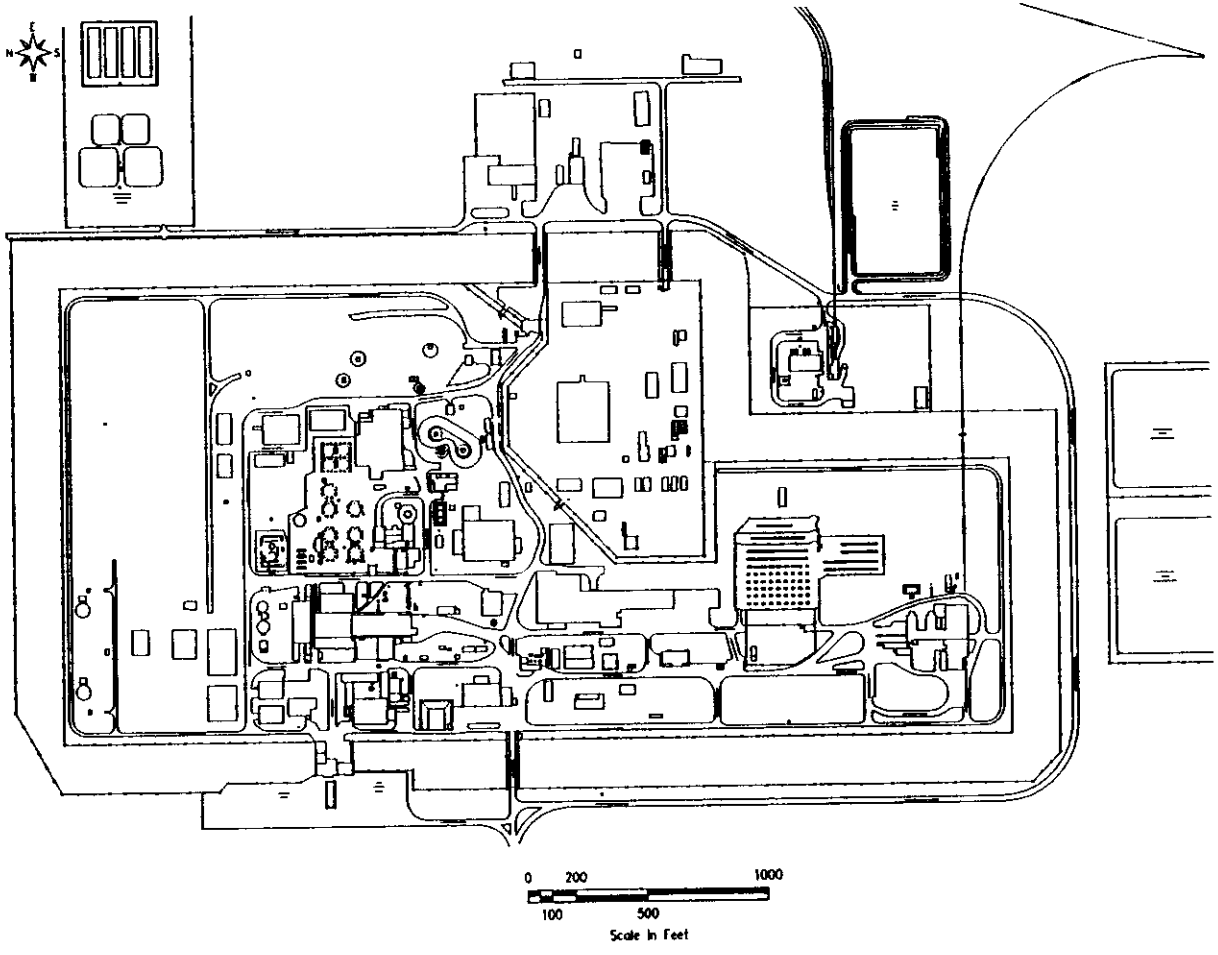
— · — · —	Rivers/Streams
═══	Boundary of Idaho National Engineering Laboratory
ARA	Auxiliary Reactor Area
ANL-W	Argonne National Laboratory-West
CFA	Central Facilities Area
EBR-I	Experimental Breeder Reactor I
EBR-II	Experimental Breeder Reactor II
ICCP	Idaho Chemical Processing Plant
IET	Initial Engine Test
LOFT	Loss-of-Fluid Test Facility
NRF	Naval Reactor Facility
PBF	Power Burst Facility
RWMC	Radioactive Waste Management Facility
TAN	Test Area North
TRA	Test Reactor Area
TSF	Test Support Facility
WRRTF	Water Reactor Research Test Facility

Figure 1-2. Location of the Soil Borings drilled for the Background Investigation.

BK - 6
698266 N
298796 E

BK - 5
701922 N
298565 E

BK - 4
705836 N
298515 E



BK - 3
704769 N
296210 E

BK - 2 701268 N
293758 E

BK - 1
698178 N
293852 E

The ICPP is located on alluvial materials deposited by the Big Lost River. Surficial sediments at the ICPP can be divided into two distinct layers. The upper layer is a poorly sorted gravel to gravelly coarse sand with abundant well-rounded small cobbles and traces of silt and clay. The larger fractions of the sediments are composed of quartzite, limestone, dolomite, and fine-grained igneous rock. This layer extends down to the basalt, generally between 40 and 50 ft below ground surface (bgs), or to a fine-grained layer that directly overlies the basalt. When encountered, the underlying fine-grained layer is composed of a fine sand to a clayey silt and is commonly from 2 to 6 ft thick, although thicknesses up to 20 ft have been recorded. This fine-grained layer appears to occur independently of the depth to basalt as the material is found in depressions and high areas on the basalt.

1.2 Project Documentation

The ICPP background investigation was developed in conjunction with the Track 2 investigation for OU 3-08. The scope for both of these investigations was originally described in the *Draft Sampling and Analysis Plan for Operable Unit 3-08 at the Idaho Chemical Processing Plant* (Lyle, 1992a). An addendum to this draft sampling and analysis plan (SAP) was prepared to address the regulatory comments received from the Idaho Department of Health and Welfare (IDHW) and Environmental Protection Agency (EPA) Region X (Lyle, 1992b). This addendum primarily involved modifications to the Track 2 investigation for OU 3-08 and did not significantly affect the scope of the background investigation. A field sampling plan (FSP) was included with this addendum; the quality assurance project plan (QAPjP) was to be submitted at a later date. Final modifications to the draft SAP were provided in a "closure" addendum (Lyle, 1992c). This addendum provided a more thorough discussion of the DQOs and included revised Method Selection Worksheets, Data Quality Objective Summary Worksheets, and the *WAG 3 Quality Assurance Project Plan* (WINCO E-035). This "closure" addendum provides the most complete discussion of the project goals for the background investigation and are summarized in Section 2 of this report.

Prior to implementing the 1992 Track 2 investigations at the ICPP, a *Field Implementation Document* (WINCO, 1992a) was prepared describing the field activities to be performed under all SAPs by WINCO. This document was used to direct field activities for the various Track 2 investigations, including the background study. It contains the technical and quality assurance/quality control (QA/QC) requirements necessary to meet the project's DQOs, including Sampling and Analysis Plan tables, location maps, field guidance forms, and a standard operating procedure (SOP) for sample acquisition, decontamination, and log keeping.

1.3 Report Organization

This report compiles the available background information on the alluvium at WAG 3 and geologically similar sites at the INEL. The report is organized in sections as follows:

Section 1 Introduction describes the purpose, scope, and organization of the report.

Section 2 Investigation summarizes the objectives of the FSP and sampling protocol and presents a summary of the data validation.

Section 3 Discussion will present the geologic setting of the ICPP, present and provide an interpretation of the data, and compare the results to previous studies of background metal and radionuclide concentrations.

Section 4 Conclusions summarizes the results from the background investigation.

Section 5 References provides a list of the references cited in the report.

Appendix A - Borehole Logs includes the logs of the borings produced during this investigation.

Appendix B - Form 1 Analytical Data consists of the Form 1 data obtained as part of this investigation.

Appendix C - Concentration Distribution Maps of the constituents included in this investigation.

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2.0 INVESTIGATION

This section describes the project objectives, data acquisition activities, and results of the data validation to determine the background concentrations of selected metals and radionuclides at the ICPP. In addition, this section provides a discussion of the DQO process that identified the objectives of the investigation, compares the project DQOs to the actual accomplishments of the investigation, and summarizes whether or not the project's DQOs were met. Section 2.0 is organized as follows.

- Section 2.1 - Description of the project's DQOs.
- Section 2.2 - Summary of data collection procedures and activities.
- Section 2.3 - Results of the data validation and attainment of project DQOs.

2.1 Data Quality Objectives

The ICPP background investigation was intended to determine the naturally occurring concentrations of a selected list of metals and radionuclides in the alluvium above the basalt at the ICPP. This data would then be used during future environmental investigations performed under the FFA/CO to: a) allow site-related contamination to be differentiated from naturally occurring background levels, b) reduce the uncertainties in determining the risks associated with low probability hazard sites, and c) more accurately estimate the incremental risks posed to human health as a result of past site practices. These objectives were to be accomplished by collecting soil samples from areas outside the ICPP where contamination from site operations was not expected, analyzing these samples using the best available analytical techniques, and subjecting the analytical results to the highest level of data validation.

The target analyte list for this investigation was based on the composition of the high-level liquid waste and includes only those analytes normally present in soils at trace concentrations or may be present due to large scale testing (i.e., above ground testing of nuclear weapons). The metals targeted for analysis included As, Ba, Cd, Cr, Pb, Mn, Hg, Ni, Se, and Ag. All these metals are present in normal soils at trace amounts and many are also present in the waste stream at the ICPP. The radioactive parameters targeted for analysis include gross-α, gross-β, and gamma isotopic analysis using spectrometric techniques. Alpha and beta emissions result naturally from the decay of radionuclides in the uranium, thorium, and actinium decay series. Gamma isotopic analysis was performed primarily to determine the background concentrations of Cs-137. Cesium-137 is not naturally occurring,

but generally has a widespread occurrence due to the past global practice of above ground testing of nuclear weapons.

To determine the appropriate background concentrations for the ICPP, the investigative depth for the boreholes was selected to be the upper 20 ft of alluvium. This depth was based on the majority of the alluvium at the ICPP being disturbed by construction activities to a depth of 8 ft, and locally to the top of basalt. Due to this mixing of the alluvium, background concentrations from the upper 20 ft should provide a more representative concentration for the disturbed areas within the ICPP. This depth of investigation will also assist in risk evaluation where depth is a factor for the risk calculations (i.e., intrusive scenarios).

A summary of the non-quantitative DQOs and associated field activities required to meet these goals as described in the *Field Implementation Document* are provided in Table 2-1. These DQOs provide the basis for evaluating the attainment of goals (Section 2.3).

Table 2-1. Summary of the DQOs for the Background Investigation.

OBJECTIVE	FIELD IMPLEMENTATION DOCUMENT		FIELD ACTIVITY
	DATA ACQUISITION	CRITICAL SAMPLES	
Obtain ICPP-specific information on background levels to assist in risk evaluation and remediation needs.	Drill six boreholes to a total depth of 20 ft bgs. Collect grab samples from 0 to 1 ft, 3 to 5 ft, 8 to 10 ft, 13 to 15 ft, and 18 to 20 ft using California split-spoon samplers.	Per each borehole drilled, one soil sample collected from the 10 ft depth.	Boreholes: BKG-1 BKG-2 BKG-3 BKG-4 BKG-5 BKG-6

2.2 Field Investigation

The field investigation included the collection of 29 discrete soil samples from six boreholes drilled around the perimeter of the ICPP. In addition to the regular samples, six duplicate samples (one per borehole), two equipment blanks, and two field blanks were also collected for QA/QC assessment.

2.2.1 Soil Sample Collection

Borings for this investigation were drilled using a hollow-stem auger drill rig equipped with California split-spoon samplers. The locations of the boreholes are shown in Figure 1-2. For sampling Boreholes 1 through 5, five samples with one duplicate sample were taken; four samples and one duplicate sample were taken at Borehole 6. The maximum sampling depth for all six boreholes was approximately 20 ft.

A total of 35 soil samples was collected from the six boreholes and analyzed as described in Section 2.2.1.1. All samples were collected as biased grab samples. An assessment of the project's quality requirements of the sampling operation was ensured by collecting duplicate and blank samples together with the soil samples. One sample from each borehole (six samples total) was submitted to the analytical laboratory as blind field duplicates, and a total of four other QA samples (two equipment rinsate blanks and two field blanks) was submitted to the laboratory for analysis.

2.2.1.1 Laboratory Analyses. Twin Cities Testing (TCT)-St. Louis, Missouri, and Babcock and Wilcox (B&W) of Lynchburg, Virginia, were contracted by the EG&G Sample Management Office (SMO) to perform the chemical and radiological analysis, respectively. A targeted list of metals (As, Ba, Cd, Cr, Pb, Hg, Mn, Ni, Se, and Ag) was analyzed in accordance with the procedures used in the EPA's Contract Laboratory Program (CLP) as described in ERP-SOW-47/-59. A listing of the method detection limit (MDL) for these metals is provided in Table 2-2.

The radiological analyses performed on all soil samples included gamma spectrometry, gross-α, and gross-β. The selected radionuclides and associated MDLs are provided in Table 2-2.

2.2.1.2 Soil Sample Collection and Handling. Hawley Brothers Drilling of Blackfoot, Idaho, was contracted by WINCO through MK-Ferguson to conduct the drilling operations. The onsite activities, including sample collection and lithologic logging, were performed by Golder Associates, Inc., under supervision from WINCO Environmental Restoration (ER) personnel. The sample preparation and shipping was performed by WINCO ER personnel. All work was conducted in accordance with the Construction Safe Work Permit (CSWP), Hazardous Work Permit (HWP), Radiological Work Permit (RWP), Radiation Work Control Procedure (RWCP), and site-specific health and safety plan (HSP) titled *Track 2 Investigation of OU 3-07 Tank Farm and OU 3-08 Tank Farm II*.

All personnel working in the exclusion zone were required to read and understand the HSP that was posted in the field site operating base located near the sampling site. In addition, a daily health and safety meeting was

Table 2-2. Contract Required and Method Detection Limits.

CHEMICAL ABSTRACT SERVICE NUMBER	ANALYTE	CONTRACT REQUIRED DETECTION LIMIT[1]	METHOD DETECTION LIMIT
	Inorganic Compounds		
7440-38-2	Arsenic	2.0 mg/kg	NA
7440-39-3	Barium	40 mg/kg	NA
7440-47-3	Chromium	2.0 mg/kg	1.0 mg/kg
7440-43-9	Cadmium	1.0 mg/kg	1.0 mg/kg
7439-92-1	Lead	1.0 mg/kg	NA
7439-96-5	Manganese	3.0 mg/kg	3.0 mg/kg
7439-97-6	Mercury	0.05 mg/kg	0.05 mg/kg
7440-02-0	Nickel	8.0 mg/kg	4.0 mg/kg
7782-49-2	Selenium	1.0 mg/kg	0.21 mg/kg
7440-22-4	Silver	2.0 mg/kg	0.21 mg/kg
	Radionuclides		
NA	Gross Alpha	10 pCi/g	5 pCi/g
NA	Gross Beta	10 pCi/g	6 pCi/g
NA	Gamma Isotopes (based on Cs-137)	1 pCi/g	0.006 pCi/g

[1] Contract Required Detection Limits are specified in EG&G's Statement of Work (ERP-SOW-47/-59).

NA = Not Available (none of the sample results were less than the Method Detection Limit).

conducted before the start of work and documented in the field logbook. Personnel in the exclusion zone were required to wear, at a minimum, safety boots, hard hats, safety glasses, and anti-C clothing in accordance with the HSP and RWP.

A WINCO health physics technician (HPT) was onsite to monitor for personnel exposure to radiation, screen the soil samples for beta-gamma radiation using a hand-held detector, and monitor radiation levels from contaminated equipment [above normal background values (>100 cpm β,γ)]. Additional calibrated radiation screening instruments were available to other personnel at all times for personal monitoring, even though elevated radiation was not expected.

The procedures followed for locating boreholes, sampling soils during drilling, collecting samples, and sounding the borehole are described in the *Field Implementation Document* (WINCO, 1992a). The drill rig and downhole tools were decontaminated before use. The borehole locations were surveyed by WINCO personnel before drilling. Soil samples were collected for chemical and radiological analyses using California split-spoon samplers through the center of the hollow-stem augers. The depth for each sample was measured to the nearest 0.1 ft and recorded in the field logbook.

The hollow-stem augers used were 4.25-in. inside diameter (ID) and 8-in. outside diameter (OD). The borehole was advanced from the surface to just above the sample interval with the center bit inside the augers. Once the top of the sample interval was reached, the center bit was removed from the borehole and replaced with a 2-ft long California split-spoon sampler equipped with lexan liners. The sampler was then advanced using a rig-mounted hammer driving 140 lbs at the standard 30-in. drop. The number of blows required to drive the California split-spoon sampler each 6-in. increment was recorded on the borehole log by the project geologist.

After the California split-spoon sampler was removed from the borehole, it was placed on a clean sheet of plastic on a table within the exclusion zone. The California split-spoon sampler was opened, and the open ends of the lexan liners were screened for radioactivity using a hand-held detector and organic vapors using a Photovac Microtip®. To maximize consistency in the reading, the instruments were held within 1/2 in. of the sample, and the highest readings were recorded on the borehole logs (Appendix A). Field description of the lithologies encountered in each borehole are also provided in the borehole logs.

Soil for the metal and radiochemical analyses was transferred to decontaminated stainless-steel bowls and homogenized. All samples were placed in precleaned and certified sample containers, sealed, labeled, and handled according to the procedures specified in the *Field Implementation Document* (WINCO, 1992a).

All cuttings brought to the surface via the augers were screened for radioactivity and organic vapors using a hand-held detector (Ludlum 2A) and a Photovac Microtip®, respectively. Since water was not encountered, all cuttings were placed back in the borehole following the completion of the drilling/sampling operation.

2.2.2 Decontamination Procedures

All sampling equipment and small hand-held tools were decontaminated using deionized water, nonphosphate detergent, pesticide grade methanol, and ASTM Type II purity water as described in the *Field Implementation Document*.

If the sampling equipment was not used immediately, it was wrapped in plastic or aluminum foil to minimize the possibility of contamination. The drilling rig and all downhole drilling and sampling equipment were steam cleaned upon arrival at the ICPP, between each boring, and before leaving the site. If the equipment was not used immediately, it was wrapped with plastic sheeting and placed on pallets to prevent contamination.

No elevated levels of radioactivity were encountered in any of the boreholes. All waste decontamination fluids were collected and containerized onsite for proper disposal.

2.2.3 Field Documentation

The bound logbook entitled *Environmental Restoration Operable Unit 3-08 Field Logbook* contains all information pertaining to the background investigation. This logbook fulfills all requirements for documentation described in WINCO Project Directive 1.18, "ERP Field Site Logkeeping Requirements." The logbook is divided into sections including the Field Activity Daily Log, Borehole Log, Sample Collection Log, Location Map, Photo Log, Visitor Log, and Safety Briefing Log and provides a complete description of all field activities performed during the background investigation. The original document is archived in the project file.

2.3 Quality Assurance/Quality Control

The QA/QC requirements for the background investigation are specified in the Method Selection Worksheets, DQO Summary Worksheets, and QAPjP (WINCO, 1992b). The worksheets and QAPjP were incorporated in the SAP, which directed the overall investigation. This section discusses the attainment of these quality requirements and provides a summary of the data validation. Complete Form 1 data are attached as Appendix B, and other documents supporting the validation effort are available in the WINCO project files.

2.3.1 Changes to the Work Plan

The non-quantitative DQOs and field activities required to meet these DQOs are shown in Table 2-1. All planned activities, except the collection of five samples from BK-6, were completed in accordance with the DQOs. At BK-6, basalt was encountered during the collection of the fourth soil sample at a depth of 14.2 ft bgs. As such, the borehole was terminated and it was not possible to collect the fifth soil sample.

2.3.2 Documentation of Field Sampling

Field sampling documentation [including the field logbook and chain-of-custody (COC) records] was reviewed to identify concerns that could affect

data quality and useability. The overall quality of the field documentation appears to be high, and no major record keeping problems were identified during the validation process.

It was noted the custody seal numbers were not always listed on the COC forms. This is a requirement according to WINCO ER Project Directive 1.23, "ERP Chain of Custody, Sample Handling, Packaging, and Shipment." Since the coolers arrived at the laboratory with the signed custody seals intact, this discrepancy should have no impact on the data useability.

2.3.3 Summary of Method Validation

The analytical data for the background investigation consists of two sample delivery groups (SDGs) for the inorganic compounds and three SDGs for the radionuclide analyses. The SDGs and associated sample numbers are provided in Table 2-3.

The chemical data was validated in accordance with the procedures described in the *EPA Functional Guidelines for Evaluating Inorganic Analyses* (2/88) and meet the requirements of validation level "A" as described in the SMO SOP 12.1.1, "Levels of Method Validation." The limitations and validations reports providing a complete discussion concerning method validation is provided in the WINCO project files. The radiological data was validated in accordance with SMO SOP 12.1.2, "Standard Operating Procedure for Radiological Data Validation."

For the inorganic analyses, five samples per SDG underwent complete method validation to level A as described in SOP 12.1.1. This is the most stringent validation level and requires a thorough review of the laboratory procedures. Qualification of other samples for inorganic analyses was then performed by association with the validated data contained in the same SDG (i.e., the same qualification flags applied to the five validated samples were also applied to the associated samples in the same SDG). All samples were validated to Level A for radiochemical analyses.

Analytical precision was evaluated using laboratory duplicates. The results for an SDG were deemed acceptable if the duplicate results are within the ± 35% agreement limit. Analytical accuracy was evaluated based upon the recovery from the matrix spike sample. If the results from these samples are within the 75-125% recovery limit, the results from that SDG are deemed acceptable and no qualifiers applied. Analytical accuracy for radiochemical results are evaluated based on the results from the laboratory control samples. If the results from these samples are within the 80-120% recovery limits, then the results from that SDG are within the acceptable criteria and no qualifiers are added.

Table 2-3. Sample Delivery Groups and Associated Sample Numbers.

Sample Deliver Group	Sample Numbers			
30810001RN (Radionuclides)	30810001RN	30810101RN	30810201RN	30810301RN
	30810401RN	30810501RN	30810601RN	30810701RN
	30810801RN	30810901RN	30811001RN	30811101RN
	30811201RN	30811301RN	30811401RN	
30811501RN (Radionuclides)	30811501RN	30811601RN	30811701RN	30811801RN
	30811901RN	30812001RN	30812101RN	30812201RN
	30812301RN			
30806402RN (Radionuclides)	30806402RN	30806502RN	30812401RN	30812501RN
	30812601RN	30812701RN	30812801RN	30812901RN
	30813001RN	30813101RN	30813201RN	30813301RN
	30813501RN	30813601RN	30813602RN	
30810001MT (Inorganics)	30810001MT	30810101MT	30810201MT	30810301MT
	30810401MT	30810501MT	30810601MT	30810701MT
	30810801MT	30810901MT	30811001MT	30811101MT
	30811201MT	30811301MT	30811401MT	30811501MT
	30811601MT	30811701MT	30813701MT	30813702MT
30811801MT (Inorganics)	30811801MT	30811901MT	30812001MT	30812101MT
	30812201MT	30812301MT	30812401MT	30812501MT
	30812601MT	30812701MT	30812801MT	30812901MT
	30813001MT	30813101MT	30813201MT	30813301MT
	30813501MT	30813601MT	30813602MT	

2.3.3.1 Inorganic Method Validation. General QC concerns associated with the metals analysis determined 18 of the 35 samples were received at the laboratory at temperatures greater than 6°C. None of the sample's temperatures exceeded 8°C and, therefore, no qualifiers were added to the data on this basis.

Barium, Cadmium, Chromium, Mercury, and Nickel

Results for these analyses required no qualification for both SDGs. The concentrations for these metals are unrestricted for use in the background evaluation.

Arsenic

Arsenic had poor matrix spike recovery (38.8%) for SDG:30811801MT. This poor spike recovery seriously underestimates the values from this SDG, and as

a result, all As concentrations were qualified either "UJ" or "J." No problems were identified for the As results in SDG:30810001MT.

Lead

Lead samples contained no matrix spike recovery (-44.4%) for the Graphite Furnace analysis in SDG:30810001MT, and a very low matrix spike recovery (2.6%) in SDG:30811801MT. All Pb values should be considered grossly underestimated, and all concentrations from SDG:30810001MT were qualified "J" and the results from SDG:30811801MT were qualified with either a "UJ" or "J." Accounting for this high level of uncertainty, use of these values in the background evaluation is highly suspect.

Manganese

Manganese results from SDG:30810001MT were assigned a "J" qualifier due to a very low matrix spike recovery (34%). Use of the Mn values from this SDG is highly suspect. No problems were identified for the Mn results in SDG:30811801MT.

Selenium

Selenium results for both SDGs were assigned a "J" qualifier due to poor matrix spike performance (49.8% recovery in SDG:30810001MT and 36.0% in SDG:30811801MT). These results are suspect for use in the background evaluation due to the possible underestimation of all concentrations.

Silver

Silver results were assigned a "J" qualifier for SDG:30811800IMT due to poor matrix spike recovery (59%). No problems were identified for the Ag analyses in SDG:3081001MT.

2.3.3.2 Radionuclide Data Validation.

Cesium-137 and Potassium-40

Four samples (30810101, 30810601, 30810701, and 30811301) were assigned a "J" qualifier for these two radionuclides due to the instrument calibration not shown to be in control at the time of analysis. Values for these samples should be considered estimated for use in the background evaluation. The remaining sample results are unrestricted for use in the background evaluation.

Gross-Alpha

The gross-α results from SDG:30810001RN were assigned either a "UJ" or "J" qualifier because the laboratory duplicate precision was outside the 35% allowable limit. The result from sample number 308110401RN were assigned a "U" qualifier because the result was below the detection limit and uncertainty was approximately equal to the result. The gross-α results from SDG:3081151RN and SDG:30806402RN are unrestricted for use in the background evaluation.

Gross-Beta

Results from the gross-β analyses required no qualification and are unrestricted for use in the background evaluation.

2.3.3.3 Precision, Accuracy, and Completeness.

The *Quality Assurance Project Plan for WAG 3* (July 21, 1992) defines precision as the relative percent difference (RPD) or relative standard deviation (RSD) of two duplicate sample analysis (equations 1 and 2, respectively). The results for an SDG were deemed acceptable if the duplicate results are within the ± 35% agreement limit.

$$RPD = \frac{(C_1 - C_2)}{(C_1 + C_2)/2} \quad (1)$$

where,

RPD = relative percent difference
C_1 = larger of the two measurements (or larger of matrix spike/matrix spike duplicate values)
C_2 = smaller of the two measurements (or smaller of matrix spike/matrix spike duplicate values)

$$RSD = \left(\frac{s}{\bar{y}}\right) * 100\% \quad (2)$$

where,

RSD = relative standard deviation
s = standard deviation
$\bar{y}$ = mean of duplicate analyses.

The standard deviation in equation 2 is defined as:

$$S = \sum_{I=1}^{n} \sqrt{\frac{(y_i - \bar{y})^2}{n-1}} \qquad (3)$$

where,

s	=	standard deviation
y_i	=	measured value of the ith duplicate
$\bar{y}$	=	mean of duplicate measurements
n	=	number of duplicates.

The accuracy of an analysis is measured by the recovery of compounds (%R) from the matrix spike and matrix spike duplicates. If the results from these samples are within the 75 to 125% recovery limit, the results from that SDG are deemed acceptable and no qualifiers applied. Analytical accuracy for radiochemical results are evaluated based on the results from the laboratory control samples. If the results from these samples are within the 80 to 120% recovery limits, the results from that SDG are within the acceptable criteria and no qualifiers are added. Sample accuracy is calculated by the following equation:

$$\%R = 100\% \times \frac{S-U}{C_{sa}} \qquad (4)$$

where,

%R	=	percent recovery
S	=	measured concentration in spiked aliquot
U	=	measured concentration in unspiked aliquot
C_{sa}	=	actual concentration of spike added.

Completeness is defined as % completeness and is given by equation (5). Completeness is generally discussed as it pertains to non-critical and critical samples with the project goals being 90 and 100%, respectively. The critical samples for this investigation, as defined in Table 2-1, are the samples collected from the 10 ft depth. All critical samples were successfully collected in the field and submitted to the laboratory for analysis. These samples were then subjected to the same analytical problems as incurred by the other "non-critical" samples as discussed in Section 2.3.3. Since these samples are not statistically more significant than the other samples for the background evaluation, the results from these samples will be included with the other samples in this section and a separate discussion on critical samples will not be provided.

$$\%C = \frac{V}{n} * 100\% \quad (5)$$

where,

%C	=	percent completeness
V	=	number of valid measurements
n	=	number of measurements specified in the SAP.

The laboratory precision, accuracy, and completeness (PA&C) for the ICPP background evaluation are presented in Table 2-4. The PA&C presented in this table are the result from all constituents testing.

The poor performance of three elements (Pb, Mn, and Se) has lowered the accuracy, and consequently, completeness for inorganic parameters below project DQOs. The remaining elements showed much better results with only As and Ag having analytical problems in a single SDG. Table 2-5 presents the revised PA&C for ICPP background results with Pb, Mn, and Se removed from the calculation. This table indicates the adjusted overall PA&C meet the project-specific goals with Pb, Mn, and Se removed. Therefore, the following report will discuss the results from all inorganic parameters except Pb, Mn, and Se.

The radionuclide parameters showed acceptable results for the precision and accuracy, however, the completeness goal of 90% was not met. Minor qualifications to K-40 and Cs-137 were required due to poor detector performance; however, this has only a minor impact to these two elements and does not effect the useability of either in the background evaluation. For gross-α analysis, minor qualification was also required for one SDG due to poor laboratory duplicate precision. This does indicate slight estimation of results, but does not limit usage of gross-α results for the background evaluation.

In summary, completeness goals were met for all elements with the exception of Pb, Mn, and Se, and, given the high level of estimation associated with these results, these elements will not be used in the background evaluation. The two other elements having analytical problems in one of the two SDGs include As and Ag. Since Ag was not detected in any of the samples, including the samples in the SDG having no analytical problems, it is reasonable to assume the Ag concentrations are below the MDL. Therefore, the poor Ag spike recovery in a single SDG has little effect on the data useability for the background evaluation. Arsenic was detected in all samples and had poor spike recovery in one SDG. This will tend to underestimate the actual concentration for the samples in that SDG. A discussion of this uncertainty will be included with the evaluation of the results for As.

Table 2-4. Percent of Samples Meeting the Laboratory Precision, Accuracy, and Completeness Criteria.

Target Analyte	Precision[1]	Accuracy[1]	Completeness[2]
Arsenic	100%	51.3%	51.3%
Barium	100%	100%	100%
Cadmium	100%	100%	100%
Chromium	100%	100%	100%
Lead	51.3%	0%	0%
Manganese	100%	48.7%	48.7%
Mercury	100%	100%	100%
Nickel	100%	100%	100%
Selenium	100%	0%	0%
Silver	100%	51.3%	51.3%
Overall Average:	**95.1%**	**65.1%**	**65.1%**
Radionuclides - Overall Accuracy and Precision			
Target Analyte	Precision[1]	Accuracy[1]	Completeness[2]
Potassium-40	100%	92.3%	92.3%
Cesium-137	100%	92.3%	92.3%
Gross-Alpha	61.5%	100%	61.5%
Gross-Beta	100%	100%	100%
Overall Average:	**90.4%**	**95.5%**	**86.5%**

[1] Expressed as percent of samples vs the total number of samples analyzed that meet the criteria stated in the SAP.

[2] Expressed as percent of samples successfully analyzed compared to number of samples sent to the laboratory.

Table 2-5. Adjusted Percent of Samples Meeting the Laboratory Precision, Accuracy, and Completeness Criteria for the Inorganic Analysis.

Target Analyte	Precision[1]	Accuracy[1]	Completeness[2]
Arsenic	100%	51.3%	51.3%
Barium	100%	100%	100%
Cadmium	100%	100%	100%
Chromium	100%	100%	100%
Mercury	100%	100%	100%
Nickel	100%	100%	100%
Silver	100%	51.3%	51.3%
Average:	100%	91.9%	91.9%

[1] Expressed as percent of samples vs the total number of samples analyzed that meet the criteria stated in the SAP.

[2] Expressed as percent of samples successfully analyzed compared to number of samples sent to the laboratory.

Table 2-4. Laboratory Precision, Accuracy, and Completeness.

Target Analyte	Precision[1]	Accuracy[1]	Completeness[2]
Arsenic	100%	51.3%	51.3%
Barium	100%	100%	100%
Cadmium	100%	100%	100%
Chromium	100%	100%	100%
Lead	51.3%	0%	0%
Manganese	100%	45.9%	45.9%
Mercury	100%	100%	100%
Nickel	100%	100%	100%
Selenium	100%	0%	0%
Silver	100%	51.3%	51.3%
Overall Average:	**95.1%**	**64.9%**	**64.9%**
Radionuclides - Overall Accuracy and Precision			
Target Analyte	Precision[1]	Accuracy[1]	Completeness[2]
Potassium-40	100%	92.3%	92.3%
Cesium-137	100%	92.3%	92.3%
Gross-Alpha	61.5%	100%	61.5%
Gross-Beta	100%	100%	100%
Overall Average:	**90.4%**	**95.5%**	**86.5%**

[1] Expressed as percent of samples meeting the criteria stated in the SAP.

[2] Expressed as percent of samples successfully analyzed compared to number of samples sent to the laboratory.

Table 2-5. Adjusted Laboratory Precision, Accuracy, and Completeness for the Inorganic Analysis.

Target Analyte	Precision[1]	Accuracy[1]	Completeness[2]
Arsenic	100%	51.3%	51.3%
Barium	100%	100%	100%
Cadmium	100%	100%	100%
Chromium	100%	100%	100%
Mercury	100%	100%	100%
Nickel	100%	100%	100%
Silver	100%	51.3%	51.3%
Average:	100%	91.9%	91.9%

[1] Expressed as percent of samples meeting the criteria stated in the SAP.

[2] Expressed as percent of samples successfully analyzed compared to number of samples sent to the laboratory.

3.0 DISCUSSION OF RESULTS

This section provides a discussion of the results from the background investigation. A description of the site-specific geology is provided first, followed by a summary and statistical evaluation of the analytical data. Finally, the ICPP background concentrations are compared to results from other background investigations at the INEL.

3.1 Site Geology

The Big Lost River Alluvium occupies approximately 60 mi^2 on the INEL, extending about 25-mi northeastward through the western-central part of the site. The Big Lost River Alluvium varies from approximately 30 ft wide in the southern INEL to approximately 4.5 mi wide in the central portion. The alluvium and associated sediments cover a large portion of the central INEL and include the ICPP, Test Reactor Area (TRA), Central Facilities Area (CFA), and Radioactive Waste Management Complex (RWMC).

According to Nace et al. (1956), the Big Lost River Alluvium originated chiefly from upstream areas in the Lost River Range west of the INEL. The sediments in the central and southern segments of the plain are chiefly gravel, with locally varying amounts of silt and sand matrix and a few lenses of silt and sand. Northward the sediment is fine gravel, sand, and silt. In the coarse gravel, cobbles larger than 10-in. diameter are rare. The degree of size-sorting ranges from excellent to very poor, but much of the material is moderately well sorted. The amount of silt and fine sand ranges up to about 80 percent of the total, but local layers may contain so little silt and fine sand that the pebbles form open-work gravel.

The geochemistry of unconsolidated deposits, such as the Big Lost River Alluvium, depend on the composition of the clasts that make up the sediment. This, in turn, is dependent on the source of the sediment (provenance), size-distribution of the clasts, and post depositional processes (i.e., diagenesis, pedogenesis, etc.). Nace et al. (1956) notes the pebbles and cobbles are a host of different parent rocks including welded tuff, rhyolite, andesite, basalt, volcanic glass, granitic rocks, quartzite, limestone, chert, and chalcedony. Sand particles are similar in composition, but include numerous grains of feldspar.

Bartholomay et al. (1989) is the best available report concerning the mineralogy and grain-size distribution of the modern Big Lost River sediments. This report recognized two distinct sediment types/facies in the alluvium (channel facies and overbank facies). These facies differ in grain-size distribution and mineralogy. Samples from the channel facies are relatively coarse-grained and have low clay/detrital mica contents, whereas samples from

overbank deposits are much finer-grained and have higher clay/detrital mica contents (Table 3-1).

Table 3-1. Comparison of the Modern Channel and Overbank Deposits from the Big Lost River (Bartholomay et al., 1989).

Grain-Size Distribution		
	Channel Deposits	Overbank Deposits
Mean Gravel Content	59%	6%
Mean Sand Content	39%	46%
Mean Silt + Clay Content	2%	48%
Mean Values of Mineral Content		
	Channel Deposits	Overbank Deposits
Quartz	38%	33%
Plagioclase	24%	16%
Potassium Feldspars	13%	11%
Calcite	3%	7%
Pyroxene	11%	8%
Dolomite	0%	5%
Detrital mica and clays	10%	20%

The mineralogical differences between the channel and overbank deposits may effect the background levels of certain constituents in the sediments. The more labile and easily weathered minerals (i.e., pyroxene, plagioclase, and potassic feldspars) are more abundant in the coarser sediments than in the finer sediments. Weathering products, including detrital mica and clay are more abundant in the finer-grained sediments and should enrich the sediments in aluminum, potassium, and possibly in certain transition metals.

As part of the background investigation, 29 soil samples were collected in the field and visually logged by the rig geologist following the Unified Soil Classification System (USCS). Since two of the samples were logged as consisting to two different soil types within the sampler, 31 soil descriptions were made in the field by the rig geologist. The distribution of

the soil types are as follows:

Well graded sands, gravelly sands	75%
Poorly sorted sands, gravelly sands	13%
Well graded gravel, gravel-sand mixtures	6%
Inorganic silts and very fine sands	6%
	100%

From this distribution, 94% of the samples were of well to poorly graded gravelly sands or gravel-sand mixtures, typical of the Big Lost River Alluvium. Two of the samples (6%) were visually identified as inorganic silts and very fine sands. These samples may represent local lenses of silts and sands that occasionally occur in the Big Lost River Alluvium. A comparison of the metal and radionuclide concentrations from these fine-grained samples to the typical sand-gravel mixtures will be discussed in Section 3.2.

3.2 Statistical Analysis of Results

This section summarizes the statistical evaluation to determine background concentrations of metals and radionuclides in the Big Lost River Alluvium at the ICPP. The statistical approach is consistent with the procedures outlined in EPA guidance (EPA, 1992), which references Gilbert (1987) and standard statistical approaches (Huntsberger et al., 1980).

As discussed in Section 2, soil samples were collected from six locations outside the ICPP perimeter fence as shown in Figure 1-2. At each location, individual soil samples were collected at six discrete depths, except at background location #6 where only five depths were sampled. In addition to the regular samples, a duplicate sample was collected at each borehole location. The results from the duplicate sample were then averaged with the corresponding sample concentration of the same depth for the purposes of the statistical evaluation.

Tables 3-2 and 3-3 present the sample locations, sample depths, identification numbers, validation flags, and concentrations of the metals and radionuclides, respectively. The concentrations and calculated mean for these constituents are also shown graphically in relation to the ICPP in the figures provided in Appendix C (note: figures do not include Pb, Mn, and Se due to poor data quality). All results for Cd, Hg, Se, and Ag were non-detects and, therefore, no statistical evaluation was performed. For the constituents having detectable and non-detectable concentrations, a concentration equal to one half the detection limit for the non-detects was used for the statistical evaluation. Data validation recommended against using the Pb, Mn, and Se results due to poor matrix spike recoveries. The results from these analyses are provided in Table 3-2, however, no statistical evaluation will be performed on the data.

Table 3-2. Analytical Results for the Inorganic Analyses.

BORING No.	DEPTH SAMPLED (ft)	FIELD ID	LAB ID (Metals)	Arsenic		Barium		Cadmium		Chromium		Lead		Manganese		Mercury		Nickel		Selenium		Silver	
				Result (mg/kg)	Q	Result (mg/kg)	Q	Result (mg/kg)	Q	Result (mg/kg)	Q	Result (mg/kg)	Q	Result (mg/kg)	Q	Result (mg/kg)	Q	Result (mg/kg)	Q	Result (mg/kg)	Q	Result (mg/kg)	Q
BK1	0-1	30810001	92005181	3.6		171		1	U	14.4		14.6	J	331	J	0.050	U	18.1		0.21	UJ	0.21	U
BK1	3-4.3	30810101	92005182	5.3		143		1	U	14.2		14.4	J	173	J	0.050	B	18.9		0.21	UJ	2.10	U
BK1	8-9.2	30810201	92005183	4.5		77.5		1	U	15.2		33.3	J	185	J	0.050	U	16.9		0.21	UJ	0.21	U
BK1	13-13.9	30810301	92005184	4.0		44.7		1	U	16.6		13.6	J	154	J	0.050	U	17.2		0.21	UJ	0.21	U
BK1	18.5-19.7	30810401	92005185	4.5		114		1	U	19.0		17.8	J	183	J	0.050	U	18.0		0.21	UJ	0.21	U
BK1	18.5-19.7 Dup	30810501	92005186	5.1		88.4		1	U	14.8		10.9	J	155	J	0.050	U	14.0		0.21	UJ	0.21	U
BK2	0-1.5	30810601	92005175	4.4		217		1	U	21.3		16.7	J	387	J	0.050	U	25.0		0.21	UJ	2.10	U
BK2	3-3.6	30810701	92005176	5.1		83.3		1	U	12.6		10.0	J	130	J	0.050	U	13.6		0.20	UJ	0.20	U
BK2	8-8.8	30810801	92005177	4.6		69.8		1	U	19.2		13.6	J	145	J	0.050	U	18.4		0.20	UJ	2.00	U
BK2	13-14	30810901	92005179	5.2		48.9		1	U	12.2		11.5	J	123	J	0.050	U	12.6		0.21	UJ	2.10	U
BK2	18-19.2	30811001	92005180	3.7		71.1		1	U	17.4		15.8	J	174	J	0.050	U	21.1		0.21	UJ	2.10	U
BK2	3-3.6 Dup.	30811101	92005178	3.8		68.7		1	U	15.3		10.0	J	135	J	0.050	U	16.3		0.20	UJ	2.00	U
BK3	0-1	30811201	92005169	6.4		156		1	U	21.6		10.8	J	195	J	0.050	U	24.3		0.21	UJ	0.21	U
BK3	3-3.7	30811301	92005170	3.1		67.1		1.2	U	11.8		7.9	J	144	J	0.050	U	13.7		0.21	UJ	0.71	B
BK3	8.0-10	30811401	92005172	3.1		73.7		1	U	15.8		NA		124	J	0.050	U	14.8		0.20	UJ	2.00	U
BK3	13-14	30811501	92005173	3.7		99.2		1	U	20.0		11.2	J	171	J	0.050	U	17.1		0.21	UJ	0.21	U
BK3	18-19.2	30811601	92005174	6.4		115		1.2	U	20.8		15.4	J	284	J	0.060	U	20.3		0.24	UJ	2.40	U
BK3	3-3.7 Dup.	30811701	92005171	4.3		104		1.2	U	25.1		8.7	J	196	J	0.060	U	22.2		0.24	UJ	0.24	U
BK4	0-1	30811801	92005200	5.4	J	242		1	U	27.1		11.7	J	332	J	0.050	U	40.3		0.26	UJ	0.33	BJ
BK4	3.0-5	30811901	92005201	1.3	BJ	28.7	B	1	U	3.5		11.1	J	60.6	J	0.050	U	6.9	B	0.20	UJ	0.20	UJ
BK4	8-9.8	30812001	92005203	3.5	J	76.9		1	U	12.8		7.7	J	122		0.050	U	18.6		0.23	UJ	0.20	UJ
BK4	13-14.5	30812101	92005204	3.0	J	57.0		1	U	14.1		6.6	J	127		0.050	U	20.0		0.20	UJ	0.20	UJ
BK4	18-19	30812201	92005205	7.5	J	95.4		1	U	18.2		15.0	J	237		0.050	U	25.6		0.21	UJ	0.21	UJ
BK4	3.0-5 Dup.	30812301	92005202	0.41	BJ	30.4	B	1	U	2.0		5.6	J	67.7		0.050	U	7.9	B	0.20	UJ	0.20	UJ
BK5	0-1	30812401	92005194	2.4	J	164		1	U	13.7		10.8	J	337		0.050	U	21.2		0.20	UJ	0.20	UJ
BK5	3.0-5	30812501	92005195	0.63	BJ	32.7	B	1	U	2.6		4.3	J	61.6		0.050	U	8.1		0.20	UJ	0.20	UJ
BK5	8-9.8	30812601	92005197	4.3	J	47.3		1	U	11.6		10.3	J	120		0.050	U	15.9		0.20	UJ	0.20	UJ
BK5	13-14.2	30812701	92005198	5.3	J	44.4		1	U	10.3		12.2	J	88.6		0.050	U	13.2		0.21	UJ	0.21	UJ
BK5	18-18.8	30812801	92005199	3.8	J	109		1	U	19.9		13.8	J	226		0.050	U	22.6		0.21	UJ	0.21	UJ
BK5	3.0-5 Dup.	30812901	92005196	0.98	BJ	35.7	B	1	U	1.2	U	1.9	J	29.2		0.050	U	4.3	U	0.20	UJ	0.20	UJ
BK6	0-1	30813001	92005189	5.9	J	203		1	U	17.4		10.9	J	387		0.050	U	23.3		0.38	BJ	0.20	UJ
BK6	3-4.6	30813101	92005190	1.4	BJ	80.0		1	U	9.4		5.5	J	132		0.050	U	15.5		0.20	UJ	0.20	UJ
BK6	8-8.7	30813201	92005191	1.9	BJ	41.9	B	1.2	U	7.6		4.0	J	103		0.060	U	12.7		0.23	UJ	0.23	UJ
BK6	13-14.2	30813301	92005193	7.8	J	260		1.2	U	21.0		10.8	J	327		0.060	U	32.2		0.25	UJ	0.25	UJ
BK6	3-4.5 Dup.	30813501	92005192	0.62	BJ	24.3	B	1	U	5.0		1.2	J	89.7		0.050	U	15.8		0.36	BJ	0.20	UJ
				(ug/L)		(ug/L)		(ug/L)		(ug/L)		(ug/L)		(ug/L)		(ug/L)		(ug/L)		(ug/L)		(ug/L)	
QC	Field Blank	30813601	92005167	2.0	U	2.0	U	7.0		6.0	U	2.0	UJ	4.0	U	0.100	U	15.0	B	1.00	UJ	1.00	UJ
QC	Field Blank	30813602	92005168	2.0	U	2.0	U	7.0		6.0	U	2.0	UJ	4.0	U	0.100	U	18.0	B	1.00	UJ	1.00	UJ
QC	Rinsate	30813701	92005187	2.0	UJ	2.0	U	5.0	U	6.0	U	3.0	J	3.0	U	0.100	U	21.0	U	1.00	UJ	1.00	UJ
BK4	Field Blank	30813702	92005188	2.0	UJ	2.0	U	5.0	U	6.0	U	2.0	UJ	3.0	U	0.100	U	21.0	U	1.00	UJ	1.00	UJ

Symbol Definition

Q - Data qualifier.

U - Analyte not detected and sample concentration less than the instrument detection limit (IDL).

B - Analyte detected and sample concentration is greater than the IDL but less than the contract required detection limit (CRDL).

UJ - Result less than the IDL, but considered estimated due to quality control problems. Analyte may or may not be present.

BJ - Result greater than the IDL but less than the CRDL. Analyte considered to be estimated due to quality control problems and may or may not be present.

J - Analyte detected and concentration is estimated due to quality control problems.

NA - Analysis not performed on the sample.

Table 3-3. Analytical Results for the Radionuclide Analyses.

BORING No.	DEPTH SAMPLED (ft)	FIELD ID	LAB ID (Rad.)	K-40			Cs-137			Gross Alpha			Gross Beta		
				Results (pCi/g)	Error	Q	Results (pCi/g)	Error	Q	Results (pCi/g)	Error	Q	Results (pCi/g)	Error	Q
BK1	0-1	30810001	920338-12	18.4	0.9		0.006	ND	U	8.93	1.47	J	18.4	1.7	
BK1	3-4.3	30810101	920338-23	18.3	0.9	J	0.0187	0.0039	J	7.53	1.22	J	22.5	2.0	
BK1	8-9.2	30810201	920338-05	17.8	1.0		0.006	ND	U	12.6	2.0	J	23.0	2.1	
BK1	13-13.9	30810301	920338-24	19.8	0.9		0.0344	0.0048		9.89	1.56	J	25.1	2.3	
BK1	18.5-19.7	30810401	920338-06	19.2	0.9		0.006	ND	U	5	0.8	UJ	20.8	1.9	
BK1	18.5-19.7 Dup	30810501	920338-11	22.1	1.1		0.006	ND	U	9.85	1.64	J	21.2	2.0	
BK2	0-1.5	30810601	920338-10	19.7	0.9	J	0.669	0.051	J	8.5	1.3	J	23.9	2.1	
BK2	3-3.6	30810701	920338-19	16.4	0.8	J	0.0721	0.0098	J	8.66	1.43	J	24.3	2.2	
BK2	8-8.8	30810801	920338-20	18.4	0.9		0.006	0.0065		6.25	1.05	J	22.6	2.1	
BK2	13-14	30810901	920338-09	21.4	1.0		0.006	ND	U	10.0	1.6	J	22.7	2.1	
BK2	18-19.2	30811001	920338-01	16.9	0.8		0.006	ND	U	11.7	1.8	J	20.2	1.8	
BK2	3-3.6 Dup.	30811101	920338-02	18.0	0.9		0.006	ND	U	7.13	1.19	J	18.3	1.7	
BK3	0-1	30811201	920338-04	20.3	1.0		0.0583	0.0062		14.9	2.2	J	22.9	2.1	
BK3	3-3.7	30811301	920338-07	19.3	0.9	J	0.0782	0.0072	J	5.26	0.91	J	19.9	1.8	
BK3	8.0-10	30811401	920338-03	19.2	0.3		0.006	ND	U	12.7	1.9	J	24.3	2.2	
BK3	13-14	30811501	920338-08	17.7	1.0		0.006	ND	U	12.2	1.9		21.5	2.0	
BK3	18-19.2	30811601	920338-13	26.4	1.3		0.006	ND	U	16.6	2.5		26.1	2.3	
BK3	3-3.7 Dup.	30811701	920338-14	19.6	0.9		0.109	0.010		8.55	1.38		19.7	1.8	
BK4	0-1	30811801	920338-16	21.8	1.0		1.21	0.10		16.0	2.3		30.5	2.7	
BK4	3.0-5	30811901	920338-18	17.2	0.9		0.161	0.014		8.45	1.34		22.0	2.0	
BK4	8-9.8	30812001	920338-17	18.5	0.9		0.0163	0.0042		11.0	1.7		23.9	2.1	
BK4	13-14.5	30812101	920338-21	18.3	1.0		0.006	ND	U	10.3	1.6		22.1	2.0	
BK4	18-19	30812201	920338-22	23.0	1.3		0.006	ND	U	7.56	1.17		28.7	2.5	
BK4	3.0-5 Dup.	30812301	920338-15	16.8	0.8		0.0931	0.0079		6.16	1.05		19.5	1.8	
BK5	0-1	30812401	920355-07	21.9	1.1		0.556	0.041		10.5	1.6		25.1	2.3	
BK5	3.0-5	30812501	920355-08	18.0	0.9		0.318	0.248		8.06	1.32		25.3	2.3	
BK5	8-9.8	30812601	920355-01	20.0	1.0		1.35	0.01		11.7	1.9		26.2	2.4	
BK5	13-14.2	30812701	920355-06	21.2	1.0		0.303	0.026		12.2	1.9		25.4	2.3	
BK5	18-18.8	30812801	920355-05	18.3	0.9		0.699	0.048		15.2	2.3		26.9	2.4	
BK5	3.0-5 Dup.	30812901	920355-02	19.8	1.0		0.837	0.061		11.6	1.8		25.7	2.3	
BK6	0-1	30813001	920355-09	20.5	1.0		0.545	0.042		5.37	0.92		25.0	2.3	
BK6	3-4.5	30813101	920355-10	16.9	0.8		0.381	0.027		10.4	1.6		23.0	2.1	
BK6	8-8.7	30813201	920355-11	19.0	0.9		0.178	0.016		10.8	1.7		17.4	1.6	
BK6	13-14.2	30813301	920355-03	13.7	0.8		0.66	0.05		5.00	0.11	U	13.7	1.3	
BK6	3-4.5 Dup.	30813501	920355-04	19.5	0.9		0.646	0.050		8.87	1.43		24.9	2.3	
				(pCi/L)			(pCi/L)			(pCi/L)			(pCi/L)		
QC	Field Blank	30813601	920354-05	0.006	ND	U	0.006	ND	U	5	ND	U	6		U
QC	Field Blank	30813602	920354-06	0.006	ND	U	0.006	ND	U	5	ND	U	6		U
QC	Rinsate	30813701	920337-02	0.006	ND	U	0.006	ND	U	5	ND	U	6		U
BK4	Field Blank	30813702	920337-01	NA	ND		0.006	ND	U	5	ND	U	6		U

Symbol	Definition
Q	- Data qualifier.
U	- Analyte not detected and sample concentration less than the instrument detection limit (IDL).
B	- Analyte detected and sample concentration is greater than the IDL but less than the contract required detection limit (CRDL).
UJ	- Result less than the IDL, but considered estimated due to quality control problems. Analyte may or may not be present.
BJ	- Result greater than the IDL but less than the CRDL. Analyte considered to be estimated due to quality control problems and may or may not be present.
J	- Analyte detected and concentration is estimated due to quality control problems.
NA	- Analysis not performed on the sample.
ND	- Not determined.

3.2.1 Vertical Variability

The borehole logs presented in Appendix A indicate the geologic material encountered by the boreholes was sand or gravel, except for two samples collected from Borehole #6. These two samples were logged as silt (USCS classification ML) and collected at the surface (0 to 1 ft) and just above the basalt (13 to 14.2 ft). A comparison of the metal and radionuclide concentrations show the values from these two samples are consistent with the results from the other samples. Therefore, all soil samples are statistically treated as a single geologic material to calculate the mean, upper confidence limit (UCL) and upper tolerance limit (UTL).

To determine whether the metal and radionuclide concentrations varied by depth, a t-test was performed on the measured concentrations from adjacent soil sample layers (i.e., arithmetic means and standard deviations were calculated for each of the five sample layers and statistically compared between layers 1 and 2, layers 2 and 3, layers 3 and 4, and layers 4 and 5). The layers were determined from the sample intervals and correspond to the following depths:

Layer	Depth
Layer 1	0 to 1 ft
Layer 2	3 to 5 ft
Layer 3	8 to 10 ft
Layer 4	13 to 14.5 ft
Layer 5	18 to 19 ft

For each soil layer, the mean and standard deviation were calculated using the following equations:

$$\overline{x} = \frac{\sum_{i=1}^{n} x_i}{n} \qquad (6)$$

and,

$$s = \sqrt{\frac{\sum_{i=1}^{n} (\overline{x} - x_i)^2}{n-1}} \qquad (7)$$

where,

$\overline{x}$	=	sample mean
i	=	summation index
n	=	number of samples
x_i	=	individual sample concentrations
s	=	sample standard deviation.

A comparison of the means between adjacent soil layers was then performed using a standard t-test, where the null hypothesis is defined as:

$$H_o \text{ (null hypothesis)}: \quad \overline{x}_i - \overline{x}_{i+1} = 0 \tag{8}$$

This comparison is based on the difference between the means of the two adjacent soil layers and the calculated UCL and LCL for the same two adjacent soil layers. The UCL for the two soil layers was calculated using:

$$UCL = (\overline{x}_i - \overline{x}_{i+1}) + s_d \cdot t_{\alpha/2,\ n_i+n_{i+1}-2} \tag{9}$$

The LCL for the two soil layers was calculated using:

$$LCL = (\overline{x}_i - \overline{x}_{i+1}) - s_d \cdot t_{\alpha/2,\ n_i+n_{i+1}-2} \tag{10}$$

The standard deviation for the t-test (s_d) was calculated using:

$$S_d = \sqrt{\frac{[(n_i-1)\ s_i^2+(n_{i+1}-1)\ s_{i+1}^2]}{n_i+n_{i+1}-2}\left[\frac{1}{n_i}+\frac{1}{n_{i+1}}\right]} \tag{11}$$

where,

n_i	=	number of samples in soil layer i
$\overline{x}$	=	mean
i, i + 1	=	subscripts for adjacent soil layers
s_d	=	standard deviation for t-test
UCL	=	upper confidence limit
LCL	=	lower confidence limit
α	=	level of significance (0.05)

When the UCL and LCL are both positive or negative at an $\alpha = 0.05$, the mean concentration of the sample set from layer "i" is statistically greater or less than the mean of the sample set from layer "i+1." This condition identifies a statistically significant difference between the two sample sets and indicates the presence of heterogeneous soil layers. Additionally, when the UCL > 0 and LCL < 0 for two soil layers at $\alpha = 0.05$, no statistically significant difference exists between the two mean concentrations of the sample layers and they can be treated as samples collected from the same population (i.e., homogeneous soil layers).

Results from this t-test are presented in Table 3-4. These results indicate a statistically significant difference exists between the surface soils [layer 1 (0 to 1 ft bgs)] and layer 2 (3 to 5 ft bgs) for Ba, Cr, Ni, and K-40; between layer 1 and layer 3 (8 to 10 ft bgs) for Ba, Ni, and K-40; and between layer 1 and layers 4 (13 to 14.5 ft bgs) and layer 5 (18 to 19 ft) for Ba. Other statistically significant differences were sporadically identified using this t-test for the underlying soil sample layers. Based on this test, the only vertical variability identified was a decrease in the Ba concentrations with depth. Since this test did not indicate the concentrations in the surface soils (0 to 1 ft bgs) are significantly different than the underlying soils, or the underlying soils are significantly different, the background means and 95th UCLs and UTLs are reported for a single sample population.

3.2.2 Data Distribution Model

Figures 3-1 and 3-2 are histograms of the metal and radionuclide concentrations, respectively. Based on a visual examination of these histograms, some of the distributions appear to approximate a normal distribution while other distributions appear to be lognormal. To mathematically determine whether the sample data are better modeled by a normal or lognormal distribution, a W-test was performed on the sample population.

The W-test uses a calculated W statistic (W_c), which is then compared to a table value for W (W_T) at a given confidence (α). If $W_C > W_T$ at a given α (0.05) for sample size n, the data can be modeled by the normal distribution. The W-test can also be applied to test for a lognormal distribution by first transforming the data with a natural logarithm and then performing the same test.

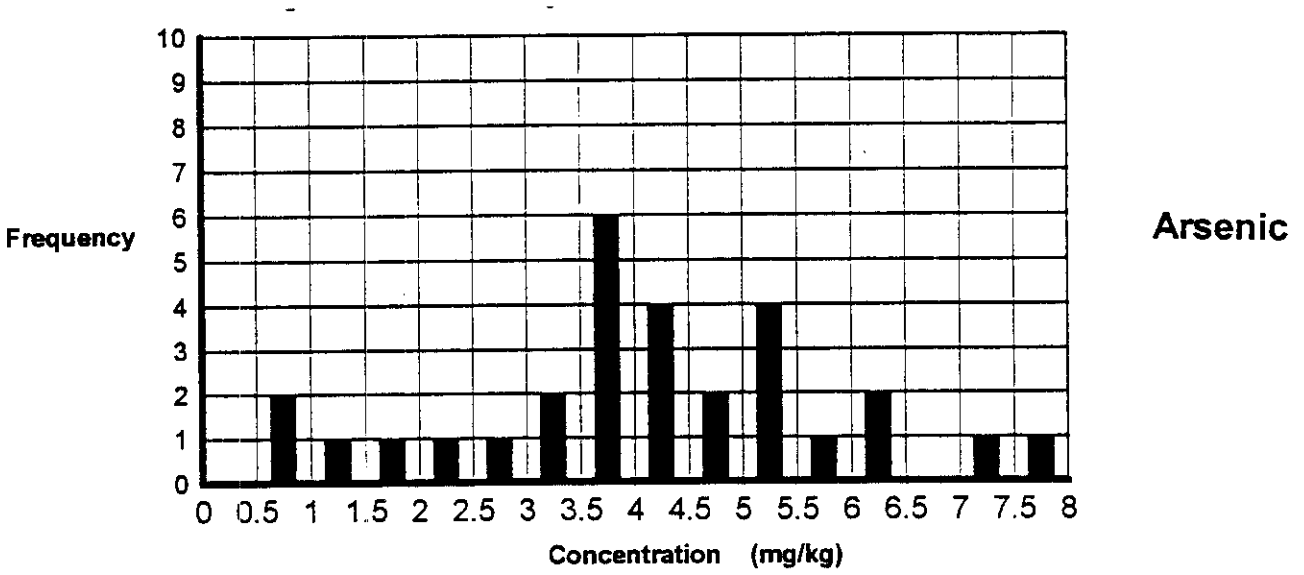
The W-test for the null hypothesis (H_o = the population has a normal distribution) was performed following the methodology outlined in Gilbert (1987). The methodology is summarized in the following steps.

Table 3-4. T-test to Determine Sample Depth Variability.

Layer Comparison	Confidence Limits	As	Ba	Cr	Ni	K-40	Cs-137	Gross Alpha	Gross Beta
1 - 2	LCL	-0.32	72.92	1.80	3.29	0.78	-0.18	-1.34	-2.05
	UCL	4.30	171.26	17.32	20.77	3.74	0.74	6.37	6.05
1 - 3	LCL	-0.64	93.60	-0.32	1.83	0.23	-0.39	-4.42	-3.07
	UCL	2.70	161.70	11.42	16.47	3.00	0.87	4.14	5.87
1 - 4	LCL	-2.22	16.81	-2.49	-2.93	-1.12	-0.13	-3.74	-2.71
	UCL	1.92	182.79	9.59	16.23	4.62	0.81	6.11	7.81
1 - 5	LCL	-2.72	55.85	-4.79	-4.27	-4.33	-0.17	-6.63	-5.55
	UCL	1.61	131.80	6.01	12.76	3.09	0.90	5.13	4.99
2 - 3	LCL	-3.04	-35.29	-11.22	-8.46	-1.75	-0.58	-5.10	-3.93
	UCL	1.12	46.41	3.20	2.69	0.46	0.49	-0.21	2.73
2 - 4	LCL	-4.56	-108.29	-13.35	-13.71	-3.25	-0.27	-4.79	-3.78
	UCL	0.27	63.71	1.34	2.94	2.23	0.39	2.13	4.88
2 - 5	LCL	-5.13	-73.91	-16.11	-14.43	-6.47	-0.30	-7.63	-6.35
	UCL	0.02	17.37	-1.79	-1.15	0.72	0.47	1.10	1.79
3 - 4	LCL	-3.00	-106.2	-7.31	-9.33	-2.56	-0.44	-2.60	-3.57
	UCL	0.63	50.50	3.31	4.33	2.83	0.65	5.25	5.87
3 - 5	LCL	-3.45	-56.15	-9.28	-8.85	-5.78	-0.48	-5.44	-6.27
	UCL	0.27	-11.49	-0.60	-0.96	1.31	0.74	4.23	2.91
4 - 5	LCL	-2.72	-93.81	-7.56	-10.38	-6.90	-0.37	-7.50	-8.37
	UCL	1.90	81.86	1.68	5.57	2.16	0.42	3.63	2.71

Indicates where a significantly difference is present at α = 0.05.

Figure 3-1. Histograms for Arsenic, Barium, Chromium, and Nickel.



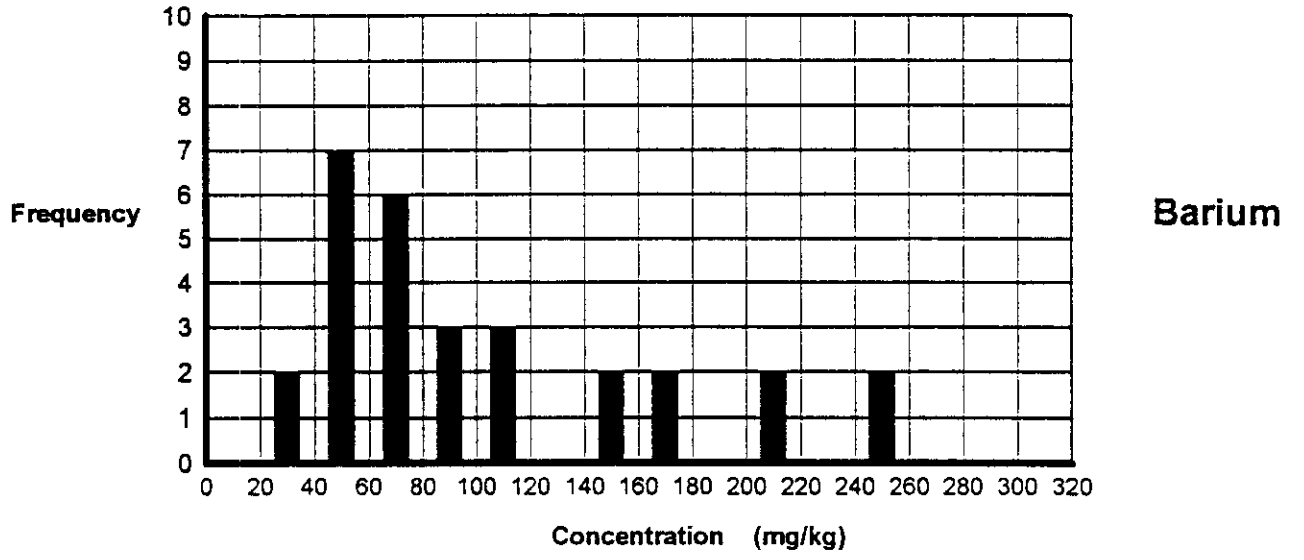
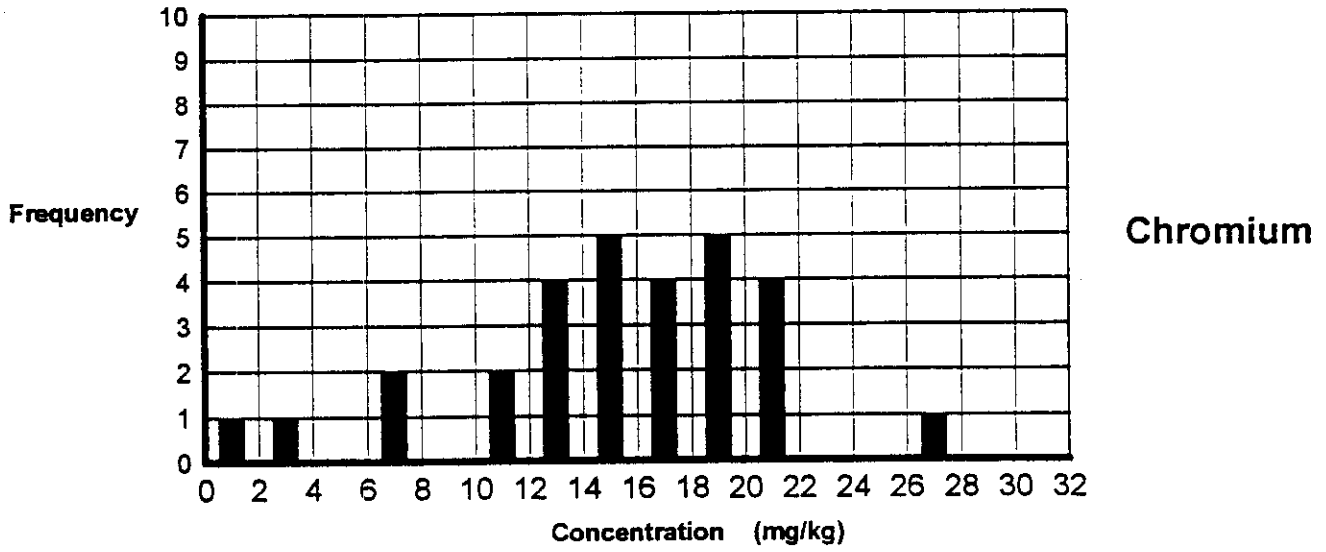


Figure 3-1 (Cont'd).



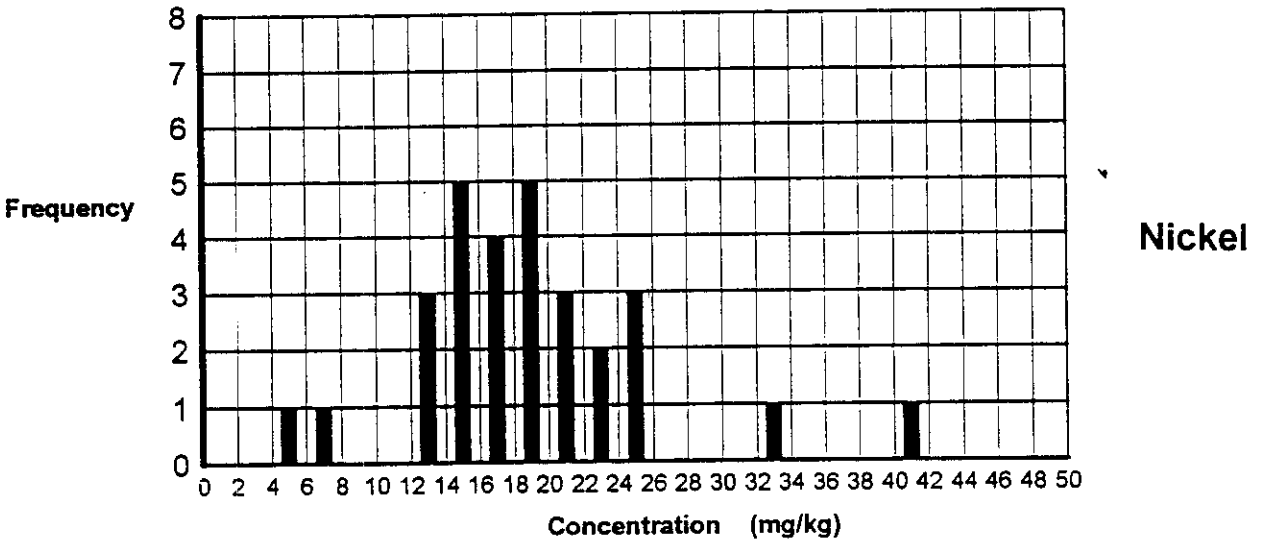
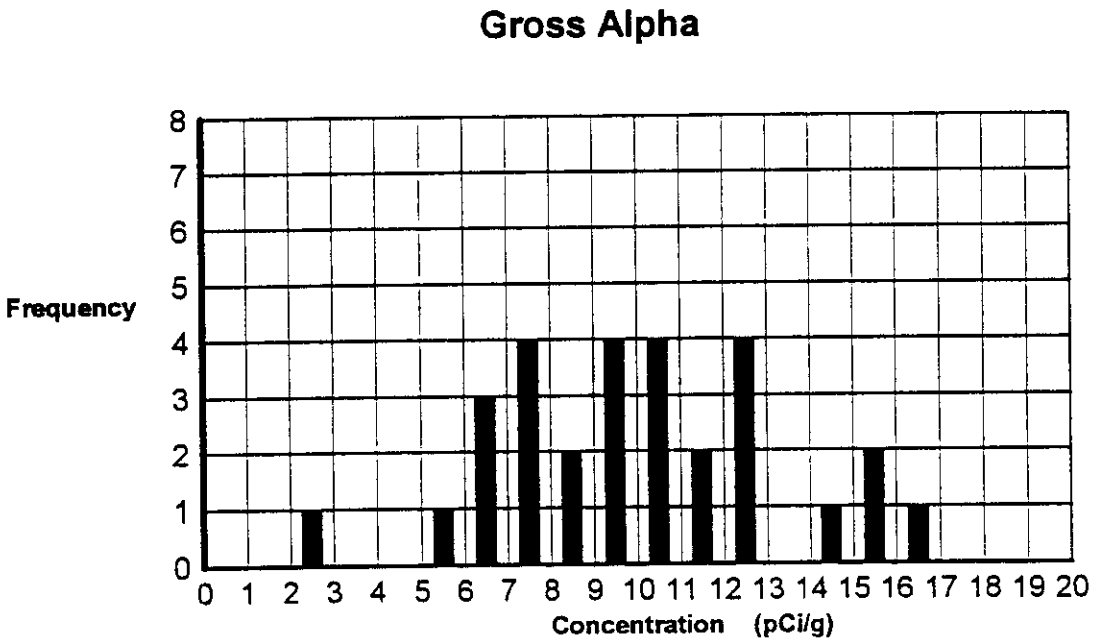


Figure 3-2. Histograms for Gross Alpha, Gross Beta, Potassium-40, and Cesium-137.



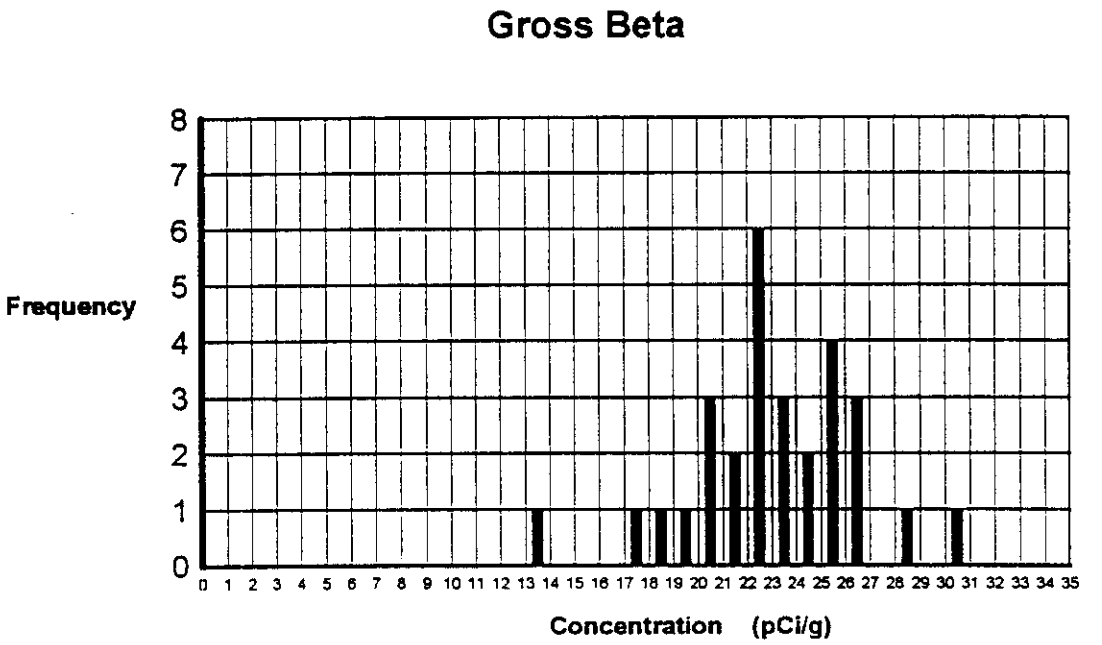
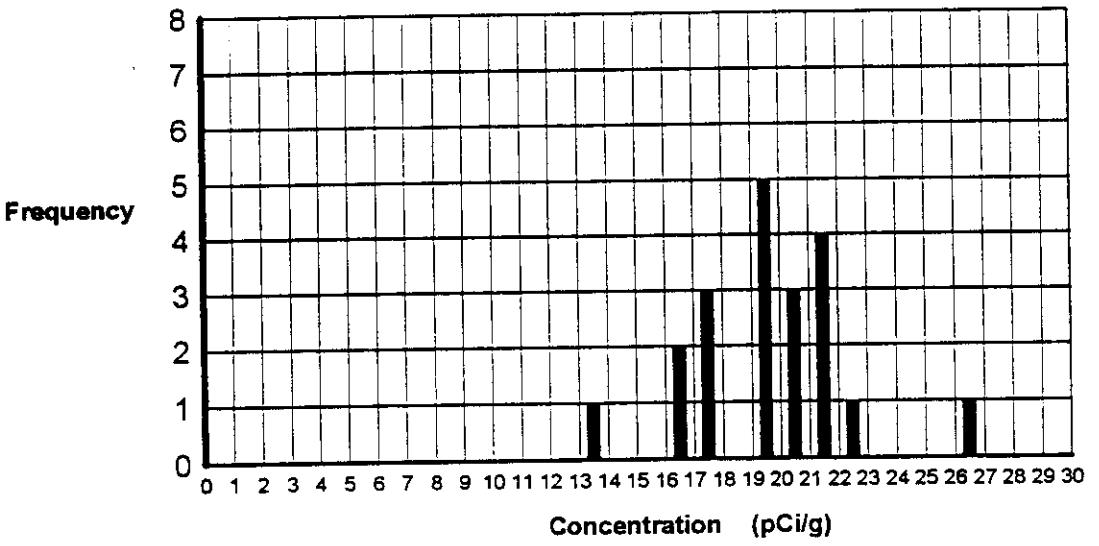
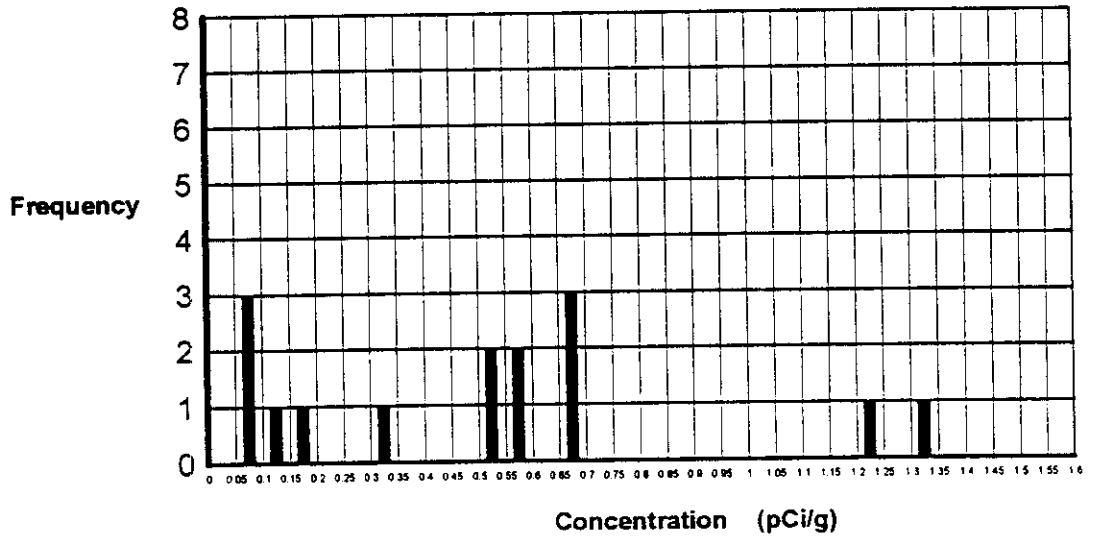


Figure 3-2 (Cont'd).

K-40



Cs-137



Step 1. Compute the denominator "d" of the W-test statistic.

$$d=\sum_{i=1}^{n} (\overline{x}-x_i)^2 \qquad (12)$$

where,

d	=	denominator
$\overline{x}$	=	mean concentration
x_i	=	individual sample concentration
n	=	number of samples
i	=	summation index.

Step 2. Sort the data from smallest to largest concentration (x_1, x_2, ..., x_n).

Step 3. Determine "k,"

$k = n/2$ if n is even

$k = (n-1)/2$ if n is odd.

Step 4. Determine the coefficients a_i (a_1, a_2, ..., a_k). Coefficients (a_i) are found in published W-test tables (Gilbert, 1987).

Step 5. Compute W_c and find W_T in published W-test tables (Gilbert, 1987).

$$W_c=1/d \left[\sum_{i=1}^{k} a_i (x_{[n-i+1]}-x_{[i]})\right]^2 \qquad (13)$$

Step 6. Reject H_o at $\alpha = 0.05$ if $W_c < W_T$; conversely, accept H_o if $W_c > W_t$.

Values of W_c were calculated for normal and lognormal distributions from the sample population and compared to the W_T values for α=0.05 (Table 3-5). For this data set, the values of W_c are less than the W_t values at an α = 0.05. This indicates the data is not statistically (to a 95% confidence) modeled by either a normal or lognormal distribution.

To estimate quantiles, proportions, or means, a model has to be selected based on the distribution of the data. The W-test has determined the distribution of the data is not statistically (to a 95% confidence)

Table 3-5. Results from the W-test.

Distribution	W_t Statistic	W_e							
		As	Ba	Cr	Ni	K-40	Cs-137	Gross α	Gross β
Normal	0.93	0.82	0.69	0.77	0.62	0.63	0.51	0.84	0.79
Lognormal	0.93	0.77	0.85	0.67	0.73	0.69	0.78	0.83	0.79

modeled by using normal or lognormal distributions. Insufficient data is available to determine whether the data is better modeled by using other, less common, distributions such as wiebull, gamma, beta, etc. Therefore, the values for the mean, 95th UCL, and 95th UTL for the normal and lognormal distributions are provided in the following subsection. These two distributions are the most commonly used to model environmental data and even though the W-test did not confirm the use, these distributions should provide the most reasonable statistical values.

3.2.3 Sample Statistics

The arithmetic statistics for the sample population were calculated using an $\alpha = 0.05$ by the following equations:

$$\overline{x} = \frac{\sum_{i=1}^{n} x_i}{n} \tag{14}$$

$$s = \sqrt{\frac{\sum_{i=1}^{n} (\overline{x} - x_i)^2}{n-1}} \tag{15}$$

$$95^{th}\ UCL = \overline{x} + \frac{s \cdot t_{\alpha, n-1}}{\sqrt{n}} \tag{16}$$

$$95^{th}\ UTL = \overline{x} + s \cdot k_{1-\alpha,\, p} \tag{17}$$

where, $\alpha = 0.05$, $p = 0.95$ and values for t and k are published in tables (Gilbert, 1987).

For the geometric statistics based on a lognormal distribution, the data were first transformed with the natural logarithm (i.e., each x_i transformed to x_i^t) and then the mean, UCL, and UTL were calculated using the following equations:

$$Geometric\ Mean = \exp\left(\frac{\sum_{i=1}^{n} x_i^t}{n}\right) \quad (18)$$

$$s^t = \sqrt{\frac{\sum_{i=1}^{n} (\overline{x^t} - x_i^t)}{n-1}} \quad (19)$$

$$95^{th}\ UCL\ on\ the\ mean = \exp\left(\overline{x}^t + 0.5\ s^{t^2} + \frac{s^t \cdot H}{\sqrt{n-1}}\right) \quad (20)$$

$$95^{th}\ UTL = \exp\left(\overline{x}^t + s^t \cdot K_{1-\alpha,p}\right) \quad (21)$$

where, the values for H are published in tables (Gilbert, 1987) and the superscript "t" refers to the transformed data.

The mean, 95th UCL, and 95th UTL calculated for the normal and lognormal distributions are presented in Table 3-6. Neither of these distributions were shown to statistically model the background data set, however, to determine the statistical parameters (e.g., mean, 95th UCL, 95th UTL), a distribution model must be applied to the data set. The two most commonly used distribution models include normal and lognormal and, as such, the application of these distribution models to the data set probably provides the most reasonable estimates for the statistical parameters to be used in the background evaluation.

The selection of the more appropriate distribution model (normal vs lognormal) for the data set is unclear based on the histograms. According to Gilbert (1987), "the lognormal distribution is the most commonly used probability density model for environmental contaminant data." Therefore, the background concentrations recommended for comparison to other ICPP contaminant concentrations are the 95th UTL based on the lognormal distribution.

Table 3-6. Mean, 95th UCL, and 95th UTL concentrations calculated for the normal and lognormal distributions.

Sample Set	Statistic	As (mg/kg)	Ba (mg/kg)	Cr (mg/kg)	Ni (mg/kg)	K-40 (pCi/g)	Cs-137 (pCi/g)	Gross Alpha (pCi/g)	Gross Beta (pCi/g)
Normal Distribution									
All Samples (0 to 20 ft)	Arithmetic Mean	4.2	104	15	19	19	0.3	10	23
	95th UCL	4.7	124	17	21	20	0.4	11	24
	95th UTL	8.1	248	28	34	25	1.1	17	31
	Maximum	7.8	260	27	40	26	1.4	17	31
Lognormal Distribution									
All Samples (0 to 20 ft)	Geometric Mean	3.7	87	14	18	19	NC	9.5	23
	95th UCL	5.5	131	20	22	20	NC	12	24
	95th UTL	13.5	335	52	42	25	NC	23	33
	Maximum	7.8	260	27	40	26	NC	17	31

NC = Not calculated because the analytical error associated with the exponentially transformed data. Please refer to text for additional detail.

The means, 95th UCLs, and 95th UTLs are calculated using a lognormal distribution model for all constituents except Cs-137. The concentrations reported for Cs-137 range from non-detect (0.006 pCi/g) to 1.5 pCi/g. Consequently, the standard deviation is substantially greater than the mean. Since the data is lognormally transformed to calculate the mean, UCL and UTL, the relatively large standard deviation of the Cs-137 concentrations results in unreasonably high values for the UCL and UTL. Additionally, the H-statistic is directly proportional to the standard deviation and it also becomes unreasonably high. As a result, modeling the Cs-137 data using a lognormal distribution model is not appropriate and in the absence of another distribution model, the normal distribution model is chosen for the Cs-137 background soil concentrations.

3.3 Comparison of Background Results

3.3.1 Metals

The metal results from this background investigation were compared to the results from other background investigations at the INEL the including *Preliminary Assessment of Surface Soils at Active EG&G Idaho Facilities* (Martin et al., 1990), *Final Report: Chemical Storage and Chemical Feed Tank Storage Areas* (University of Utah Research Institute, 1987), and *Draft Remedial Investigation and Feasibility Study Report for the Industrial Waste Ditch at the Naval Reactors Facility*, Idaho Falls, Idaho (October 1993). These investigations only evaluated metal concentrations. The summary statistics from these reports are provided in Table 3-7.

A study of the background levels of metals at the ICPP was originally performed by the University of Utah Research Institute (UURI) in 1987. Soil samples for this study were collected from three shallow boreholes, maximum depth of 2 ft, within the ICPP. No description of the soils is available, except to designate the depth of sample collection. The data from this investigation should be considered quality assurance level 3-X (EPA methods other than Contract Lab Analytical Services for which documentation and quality control information is minimal or has not been examined). Documentation is not available to upgrade this data to a higher quality assurance level.

Martin et al. (1990) sampled surface soils to establish background levels for inorganic compounds from the Power Burst Facility (PBF), CFA, TRA, and Test ARea North (TAN). The study also included 12 samples collected from undisturbed offsite locations. The offsite samples included two undeveloped sagebrush ecosystem sites in Bingham County, a river bed near Arco, and a playa east of Hope. The Martin et al. (1990) study included three data sets from the Big Lost River

Table 3-5. Background Metal Concentrations from Other INEL Studies.

	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Cr (mg/kg)	Pb (mg/kg)	Mn (mg/kg)	Hg (mg/kg)	Ni (mg/kg)	Se (mg/kg)	Ag (mg/kg)
ICPP Background (This Study)										
Mean	3.7	87	ND	14	NA	NA	ND	18	ND	ND
Std. Dev.	1.8	2	ND	2	NA	NA	ND	1	ND	ND
95th UCL	5.5	131	ND	20	NA	NA	ND	22	ND	ND
95th UTL	13.5	335	ND	52	NA	NA	ND	42	ND	ND
UURI (1987)										
Mean	6.4	255	ND	27	9	NA	0.03	NA	0.3	ND
Std. Dev.	0.8	51	ND	5	6	NA	0.01	NA	0.2	ND
95th UTL	8.7	403	ND	42	24	NA	0.07	NA	0.9	ND
TRA (Martin et al., 1990)										
Median	20.8	199	0.8	18	29	364	0.05	16	15.9	2.7
Mean	24.4	192	1.3	19	28	352	0.06	15	16.7	2.8
Std. Dev.	24.2	37	0.9	11	23	86	0.06	7	4.8	0.9
95th UTL	88.9	267	3.2	41	73	524	0.17	28	29.5	5.2
90th Percentile	28.9	238	2.5	24	42	466	0.06	23	23.0	4.3

Table 3-5 (Cont'd).

	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Cr (mg/kg)	Pb (mg/kg)	Mn (mg/kg)	Hg (mg/kg)	Ni (mg/kg)	Se (mg/kg)	Ag (mg/kg)
CFA (Martin et al., 1990)										
Median	21.9	170	3.2	20	21	274	0.05	20	17.0	3.0
Mean	21.0	177	2.8	21	27	285	0.05	21	16.2	2.7
Std. Dev.	1.3	26	1.2	3	19	88	0.01	5	1.4	0.4
95th UTL	24.7	249	6.0	29	53	530	0.08	36	20.2	3.8
90th Percentile	22.0	207	4.1	24	54	404	0.07	27	17.0	3.0
Naval Reactor Facility (October 1993)										
Mean	NA	240	NA	28	16	NA	0.11	34	NA	0.7
95th UCL	NA	264	NA	31	18	NA	0.11	37	NA	0.8

ND = Not Detected.
NA = Not Available.

Alluvium including the Arco Site, TRA, and CFA. The data from TRA and CFA are provided in Table 3-7.

The background samples for the Naval Reactor Facility (NRF) were collected from the Big Lost River stream channels located north of the facility. According to the draft RI/FS report, these undisturbed areas were chosen based on wind rose data, similar soil characteristics, and photographs. All these soil samples were collected from the surface in areas not expected to be disturbed.

A comparison of the mean concentrations calculated for the ICPP background investigation to these studies was performed for Ag, As, Ba, Cd, Cr, Hg, and Ni. It should be noted the percent recovery (%R) for Ag and As were extremely low in one SDG, which would tend to underestimate the actual value. A comparison was not performed for Pb, Mn, and Se since these metals were determined unusable for the background investigation during data validation. A complete discussion of the data validation is provided in Section 2.3.

The mean ICPP As concentration is approximately one half the mean concentration determined from the UURI study and approximately 6X lower than the concentrations determined from the Martin et al. investigations. The low As background concentration is likely due to the poor spike recovery reported in one SDG (%R=38.8%). Therefore, the As concentrations determined from this study are probably lower than the actual background concentrations and will provide conservative estimates for the background concentrations.

The mean ICPP Ba concentration is approximately one half to one third less than the mean Ba concentrations determined from the other background investigations. No analytical deficiencies were identified during data validation and, therefore, the Ba concentrations reported are representative of the background concentrations.

Cadmium was not detected in any of the samples collected for the background investigation to a MDL of 0.5 mg/kg. Cadmium was also not detected during the UURI study, however, the background mean Cd concentrations ranged from 1.3 to 2.8 mg/kg (Martin et al.). Based on the results from this investigation, background Cd concentration less than 0.5 mg/kg are representative for the ICPP.

The mean ICPP Cr concentration is slightly lower than mean concentrations determined from other investigations. No discrepancies in the analyses were identified during data validation and, therefore, the Cr concentrations determined from this study are representative, if not slightly lower, than the actual background concentrations at the ICPP.

The mean ICPP Ni concentration is within the range of background concentrations determined from other studies. Since no problems were identified during data validation, the reported Ni concentrations are representative of the background concentrations.

Silver was not detected in the ICPP background investigation to a MDL of 0.1 mg/kg. The non-detect for Ag may be partially attributed to poor matrix spike recovery (%R=59%) in one SDG. However, Ag was also not detected in the other SDG having acceptable matrix spike recovery. The mean Ag concentrations from other investigations are 2.7 mg/kg (Martin et al.), 0.72 mg/kg (NRF investigation), and not detected (UURI 1987). Based on the results from this study, the background Ag concentrations at the ICPP are less than 0.1 mg/kg.

3.3.2 Radionuclides

Previous environmental investigations at the ICPP have used background screening criteria of 20 pCi/g for alpha-emitting radionuclides and 30 pCi/g for beta-emitting radionuclides. The background concentrations for alpha- and beta-emitting radionuclides are described in a report by D. A. Anderson (EG&G Sample Management Office) using the data from a document titled *An Idaho National Engineering Laboratory Site Environmental Report for Calendar Year 1990*, DOE/ID-12082(90), June 1991. The justification for these background screening levels is provided in the following paragraphs:

Natural Alpha Activity:

Uranium-238 (U-238) is present in INEL soils at an activity level of 1.3 pCi/g. There are seven alpha-emitting daughter isotopes of U-238 [U-234, thorium-230 (Th-230), radium-226 (Ra-226), radon-222 (Rn-222), polonium-218 (Po-218), Po-214, and Po-210], which will also contribute 1.3 pCi/g each of α activity. The total α contribution of U-238 and its daughters is 8 x 1.3 for a total α activity of 10.4 pCi/g.

Th-232 is present in INEL soils at an activity level of 1.5 pCi/g. There are five alpha-emitting daughter isotopes of Th-232 (Th-228, Ra-224, Rn-220m, Po-216, and Po-212), which will also contribute 1.5 pCi/g each of α activity. The total α contribution of Th-232 and its daughters is 6 x 1.5 for a total α activity of 9 pCi/g.

Therefore, the total α activity from background in INEL soil from these isotopes is 19.4 pCi/g. The uncertainty placed on this value is ± 20%; therefore, the range of α activity expected for typical INEL soil is 19.4 ± 20% (3.9) or 15.5 to 23.3 pCi/g.

Natural Beta Activity:

The primary contributor to natural β activity in INEL soils is K-40. This isotope has been shown to be present in INEL soils at an activity level of 19 pCi/g. In addition to the K-40, there is also a β activity contribution from the beta-emitting daughter isotopes of U-238 and Th-232.

There are five beta-emitting daughter isotopes of U-238 [Th-234, Pb-214, bismuth-214 (Bi-214), Pb-210, and Bi-210]. Each of these isotopes contributes 1.3 pCi/g of beta activity. The total beta contribution of these daughter isotopes is 5 times 1.3 for a total beta activity of 6.5 pCi/g.

There are four beta-emitting daughter isotopes of Th-232 [Ra-228, Pb-212, Bi-212, and titanium-208 (Ti-208)]. Each of these isotopes contributes 1.5 pCi/g of β activity. The total β contribution of these daughter isotopes is 4 x 1.5 for a total β activity of 6 pCi/g.

There may be small contributions to β activity from other isotopes, such as Cs, but these are considered negligible for this calculation.

The total β activity you would expect in INEL soils from the isotopes listed is 31.5 pCi/g. The uncertainty of this value is also 20%; therefore, the range of β activity expected for typical INEL soil is 31.5 ± 20% (6.3), or 25.2 to 37.8 pCi/g.

It should be noted the above discussions of natural β and α activities assume U-238 and Th-232 decay chains are not broken by the release of radon gas (Anderson, personnel communications, 1993).

The Cs-137 present in the INEL soil is a result of anthropogenic activities not related to site activities (primarily aboveground atomic weapons testing). According to *The Idaho National Engineering Site Environmental Report for Calendar Year 1990* [DOE/ID-12082 (90)], the background concentration for Cs-137 at the INEL is 1.08 pCi/g.

The ICPP mean background concentration for gross-α is 9.5 pCi/g with a 95% UTL of 23 pCi/g. This mean concentration is significantly less than the calculated screening level of 20 pCi/g. However, the 95% UTL of 23 pCi/g is in good agreement with the screening level used in other environmental investigations at the ICPP, and its use as an indicator of contamination is supported by the data in this study.

The ICPP mean background concentration for gross-β is 23 pCi/g with a 95% UTL of 33 pCi/g. This mean concentration is also significantly less than

the calculated screening level of 30 pCi/g. However, the 95% UTL of 33 pCi/g is in good agreement with the screening level used in other environmental investigations at the ICPP, and its use as an indicator of contamination is supported by the data in this study.

The results from this investigation determined a mean background concentration for Cs-137 of 0.38 pCi/g with a 95% UTL of 1.1 pCi/g. Cesium-137 is the result from nuclear weapons testing, and as a result, it should only be present in the upper few inches of soil. Since the ICPP background investigation collected samples to a depth of 20 ft bgs, the Cs-137 concentrations from this investigation are expected to be significantly less than concentrations associated with surface samples. As shown in Appendix C, the occurrence of Cs-137 in the surface soils appears sporadic and some of the highest concentrations were measured in the samples collected below the surface. This distribution of Cs-137 in the subsurface places some doubt on the validity of the Cs-137 results. However, the 95% UTL of 1.1 pCi/g is in good agreement with the previously reported background concentration of 1.1 pCi/g. Given the uncertainty in the Cs-137 results, this data neither supports or refutes a screening level of 1.1 pCi/g.

4.0 CONCLUSIONS

Soil samples were collected of the Big Lost River Alluvium from six different locations outside the perimeter security fence at the ICPP. To characterize the background concentrations at each location, soil samples were collected at five discrete depths to a total depth of 20 ft bgs. Each sample was then analyzed for metals (As, Ba, Cd, Cr, Pb, Mn, Ni, Se, and Ag) and radionuclides (K-40, Cs-137, and gross-α and gross-β emitters).

Three of the metals (Pb, Mn, and Se) contained poor matrix spike recoveries and the data were determined unusable for background concentrations. Arsenic, Ag, Cs-137, and gross-α reportedly had low percent recoveries in one SDG, indicating a possible underestimation of the actual concentration. However, these concentrations were qualified as useable values (i.e., "J" flagged) during data validation. The reported concentrations for four of the metals (Hg, Cd, Se, and Ag) were reported below the MDL and no statistical analyses were performed for these metals. The remaining metals (Ba, Cr, and Ni) and gross-β concentrations were not qualified and are available for unrestricted use.

According to the Geologic Borehole Log (Appendix A), soil samples were collected from similar geologic materials (sand and gravel) except for two samples collected from background location #6. These samples were reportedly a very fine grained sand or silt. However, the detected metal and radionuclide concentrations from these samples are consistent with the concentrations from the other samples, and as a result, all samples were treated in the statistical analysis as originating from the same geologic material.

To determine whether the metal and radionuclide concentrations vary with depth, a t-test was performed on the five sample layers. Results from this t-test are presented in Table 3-4. These results indicate a statistically significant difference exists between the surface soils [layer 1 (0 to 1 ft bgs)] and layer 2 (3 to 5 ft bgs) for Ba, Cr, Ni, and K-40; between layer 1 and layer 3 (8 to 10 ft bgs) for Ba, Ni, and K-40; and between layer 1 and layers 4 (13 to 14.5 ft bgs) and layer 5 (18 and 19 ft) for Ba. Other statistically significant differences were sporadically identified using this t-test for the underlying soil sample layers. Based on this test, the only identified vertical variability was a decrease in the Ba concentrations with depth. Since this test did not indicate the concentrations in the surface soils (0 to 1 ft bgs) are significantly different than the underlying soils or the underlying soils vary significantly, the background means, 95th UCLs, and 95th UTLs were reported as a single sample population.

A W-test was performed on the data to determine whether the distribution could be better approximated using a normal or lognormal model. Results from

this tests determined the data distribution is not statistically (to a 95% confidence limit) modeled by either of these distributions. Even though these two distribution models cannot be statistically justified using the existing data, they are the most commonly used models for environmental data and probably provide the most reasonable estimates for the background evaluation. Therefore, the mean, 95th UCL, and 95th UTL concentrations for the normal and lognormal distributions are provided in Table 3-6.

The selection of the more appropriate distribution model (normal vs lognormal) for the data set is unclear based on the results from the W-test and the histograms. According to Gilbert (1987), "the lognormal distribution is the most commonly used probability density model for environmental contaminant data." Therefore, the background concentrations recommended for comparison to other ICPP contaminant concentrations are the 95th UTL based on the lognormal distribution (Table 3-6). The appropriate background concentrations determined from this study are:

Constituent	Concentration (95th UTL)
Arsenic	13.5 mg/kg
Barium	335 mg/kg
Chromium	52 mg/kg
Nickel	42 mg/kg
Gross α	23 pCi/g
Gross β	33 pCi/g
Cs-137	1.1 pCi/g
K-40	25 pCi/g

Cs-137 is present due to anthropogenic activities and as a result, were expected to be higher in the surface soil samples. However, some of the highest concentrations were detected in subsurface soils. No explanation is provided why the Cs-137 concentrations were sometimes higher at depth, however, the 95th UTL of 1.1 pCi/g is in good agreement with the previous background level of 1.08 pCi/g. Given the uncertainty in the results, this data neither supports or refutes the previous background screening level.

A comparison was performed between metal and radionuclide background concentrations presented in this report and background concentrations reported in previously published studies for locations within the INEL. The comparison indicated the background concentrations measured for the ICPP were slightly

lower or consistent with metal and radionuclide concentrations present in other published reports. The lower values are attributed to lower matrix spike recoveries, which tend to underestimate concentrations. The ICPP gross-α and gross-β 95th UTLs of 23 pCi/g and 33 pCi/g, respectively, are in good agreement with the screening level of 20 pCi/g for gross-α and 30 pCi/g for gross-β used in previous environmental investigations.

In summary, sampling from soils at the ICPP produced useable background concentrations for selected metals and radionuclides. All background metal and radionuclide concentrations, except Cs-137, were calculated based on a lognormal model of the data. For Cs-137, concentrations were determined based on a normal model of the data because data transformations resulted in unreasonably high values calculated for the UCL and UTL. The calculated background concentrations are consistent with published INEL background levels and suitable for use in risk assessments and remedial action determinations.

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5.0 REFERENCES

Bartholomay, 1990, Mineralogical Correlation of Surficial Sediment from Area Drainages with Selected Sedimentary Interbeds at the Idaho National Engineering Laboratory, Idaho, U.S. Geological Survey, Water-Resources Investigations Report 90-4147, DOE/ID-22092.

DOE-ID, 1991, The Idaho National Engineering Laboratory Site Environmental Report for Calendar Year 1990. DOE/ID-12082(90).

EPA, 1992, Supplemental Guidance to RAGS: Calculating the Concentration Term, May 1992.

FFA/CO, 1991, IDHW, U.S. EPA, U.S. DOE.

Gilbert, Richard O, 1987, Statistical Methods for Environmental Pollution Monitoring.

Huntsberger, D. V., D. J. Droft, P. Billingsley, Statistical Inference for Management and Economics.

Lyle, J., 1992a, *Draft Sampling and Analysis Plan (SAP) for Operable Unit (OU) 3-08 at the Idaho Chemical Processing Plant (ICPP) Waste Area Group 3 (WAG 3):* letter dated April 7, 1992 to W. Pierre [EPA Region X] and D. Nygard [IDHW].

Lyle, J., 1992b, *Addendum to the Draft Sampling and Analysis Plan (SAP) for Operable Unit (OU) 3-08 at the Idaho Chemical Processing Plant (ICPP) Waste Area Group 3 (WAG 3):* letter dated June 3, 1992 to W. Pierre [EPA Region X] and D. Nygard [IDHW].

Lyle, J., 1992c, *Closure* Addendum for the Draft Sampling and Analysis Plan (SAP) for Operable Unit (OU) 3-08 at the Idaho Chemical Processing Plant (ICPP) Waste Area Group 3 (WAG 3): letter dated July 31, 1992 to W. Pierre [EPA Region X] and D. Nygard [IDHW].

Martin, K.L., C.J. Barnard, A.L. Freeman, M.R. Groh, K.t. Kissel, S.J. Lord, G.L. Olson, P.D. Randolph, R.N. Wilhelmsen, 1990, Preliminary Assessment of Surface Soils at Active EG&G Idaho Facilities Data Document.

Nace, R.L., Morris Deutsh, P.T. Voegeli, 1956, Geography, Geology, and Water Resources of the National Reactor Testing Station, Idaho, Part 1 and 2.

UURI, 1987, Final Report: Chemical Storage and Chemical Feed Tank Storage Areas, University of Utah Research Institute, Salt Lake City, Ut.

WINCO, 1993 Draft Remedial Investigation and Feasibility Study Report Industrial Waste Ditch for the Naval Reactors Facility Idaho Falls, Idaho, October 1993.

WINCO, 1992a, Field Implementation Document, August 6, 1992.

WINCO, 1992b, Quality Assurance Project Plan.

APPENDIX A

Borehole Logs

Reference	
Field Activity Daily Log Page(s)	18-20

ENVIRONMENTAL RESTORATION
BOREHOLE LOG

Depth (ft)	Blow Counts	Sample Type	Organics (ppm)	Rad. (cpm)	Lithologic USCS Symbol	Geologic Description
0	7 18 35 32	CA SS 1.8/2.0			SW	0.0 to 1.8; dry, very dense, pale yellowish brown (10 YR 4/2) unstratified, fine to coarse, rounded to subrounded SAND and small to medium rounded to subangular GRAVEL, little organics: FLUVIAL DEPOSITS
5	32 49 50/0.3	CA SS 1.2/1.3			SW	3.0 to 4.3; dry, very dense, pale yellowish brown (10 YR 4/2) unstratified, fine to coarse, rounded to subrounded SAND and small to medium rounded to subangular GRAVEL, FLUVIAL DEPOSITS
10	25 49 50/0.2	CA SS 1.2/1.2			GW	9.0 to 9.2; dry to damp, very dense pale yellowish brown (10 YR 4/2) unstratified, small to medium rounded to subrounded GRAVEL and medium to coarse rounded to subrounded SAND: FLUVIAL DEPOSITS
15	50 50/0.4	CA SS 0.9/0.9			SW	13.0 to 13.9; damp, very dense, dark yellowish brown 10 YR 4/2) unstratified, medium to coarse rounded to subrounded SAND and small to medium rounded to subrounded GRAVEL: FLUVIAL DEPOSITS
20	67 125 28/0.2	CA SS 1.2/1.2			SW	18.5 to 19.7; damp, very dense, dark yellowish brown 10 YR 4/2) unstratified, medium to coarse, rounded to subrounded SAND and small to medium rounded to subrounded GRAVEL: FLUVIAL DEPOSITS TD hole 19.7 BGS

ECA: None Location: Background Borehole #1

Drilling Subcontractor: Hawley Brothers (Blackfoot, Idaho)

Borehole Diameter: 8 inches Drill Method 4 inch hollow stem auger

Logged by: Arden Baily (GAI Geolgist) Reviewed by: _____

Sample Method California split spoon sampler driven with a 140 lb hammer

Signature: _____ Date: 11 Aug 92

Reference

Field Activity Daily Log Page(s) 21-24

ENVIRONMENTAL RESTORATION
BOREHOLE LOG

Depth (ft)	Blow Counts	Sample Type	Organics (ppm)	Rad. (cpm)	Lithologic USCS Symbol	Geologic Description
0	7 25 38 42	CA SS 1.8/2.0			SW	0.0 to 1.3; dry, very dense, pale yellowish brown (10 YR 6/2) unstratified, fine to coarse, rounded to subrounded SAND and small to medium rounded GRAVEL, trace silt, trace organic
	37 50.03	CA SS 0.6/0.8			GW	1.0 to 3.6; dry, very dense, pale yellowish brown (10 YR 6/2) unstratified, small to medium, rounded GRAVEL and medium to coarse rounded to subrounded SAND: FLUVIAL DEPOSITS
5						
	65 125 140.33	CA SS 1.0/1.0			SW	8.0 to 9.4; dry, very dense, pale yellowish brown (10 YR 6/2) unstratified, fine to coarse rounded to subrounded SAND and small to medium rounded GRAVEL: FLUVIAL DEPOSITS
10						
	90 175	CA SS 1.0/1.0			SW	13.0 to 14.0; dry to damp, very dense, dark yellowish brown (10 YR 4/2) unstratified, fine to coarse rounded to subangular SAND and small to medium rounded to subrounded GRAVEL: FLUVIAL DEPOSITS
15						
	45 65 80	CA SS 1.5/1.5			SW	18.0 to 19.5; damp, very dense, dark yellowish brown (10 YR 4/2) unstratified, fine to coarse, rounded to subrounded SAND and small to medium rounded to subrounded GRAVEL: FLUVIAL DEPOSITS TD hole at 19.5 BGS
20						

ECA: None Location: Background Borehole #2

Drilling Subcontractor: Hawley Brothers (Blackfoot, Idaho)

Borehole Diameter: 8 inches Drill Method 4 inch hollow stem auger

Logged by: Arden Baily (GAI Geolgist) Reviewed by: _____

Sample Method California split spoon samler driven with a 140 lb hammer

Signature: _____ Date: 11 Aug 92

Reference
Field Activity Daily Log Page(s) 24–25

ENVIRONMENTAL RESTORATION
BOREHOLE LOG

Depth (ft)	Blow Counts	Sample Type	Organics (ppm)	Rad. (cpm)	Lithologic USCS Symbol	Geologic Description
0	9 21	CA SS 1.7/2.0			SW	0.0 to 1.0; dry, very dense, pale yellowish brown (10 YR 4/2) unstratified, medium to coarse, rounded to subrounded, SAND and small to medium, rounded to subrounded GRAVEL – FLUVIAL DEPOSITS
	32 48	CA SS 1.7/2.0			SP	1.0 to 1.7 and 3.0 to 3.7; dry, very dense pale yellowish brown (10 YR 4/2) structureless fine to medium SAND: FLUVIAL DEPOSITS
	23 35	CA SS 1.7/2.0			SP	
	39 46	CA SS 1.7/2.0			SW	3.7 to 4.7; dry, very dense, pale yellowish brown (10 YR 6/2) unstratified, fine to coarse, rounded to subrounded SAND and small rounded to subrounded GRAVEL: FLUVIAL DEPOSITS
5						
	12 15 17 26	CA SS 2.0/2.0			SW	8.0 to 10.0; dry dense, pale yellowish brown (10 YR 6/2) unstratified, medium to coarse rounded to subangular SAND and small ruonded to subrounded GRAVEL: FLUVIAL DEPOSITS
10						
	55 89	CA SS 1.0/1.0			SW	13.0 to 14.0; dry to damp, very dense, pale yellowish brown (10 YR 6/2) unsaturated, medium to coarse, rounded to subrounded SAND and small to medium rounded to subrounded GRAVEL: Fluvial Deposits
15						
	27 72 50/0.2	CA SS 1.2/1.2			SW	18.0 to 19.0; Damp, very dense, pale yellowish brown (10 YR 6/2) unstratified, fine to coarse, rounded to subrounded SAND, some small rounded to subrounded GRAVEL: FLUVIAL DEPOSITS
20						TD Hole 19.2 BGS

ECA: None Location: Background Borehole #3

Drilling Subcontractor: Hawley Brothers (Blackfoot, Idaho)

Borehole Diameter: 8 inches Drill Method 4 inch hollow stem auger

Logged by: Arden Baily (GAI Geolgist) Reviewed by:

Sample Method California split spoon samler driven with a 140 lb hammer

Signature: Date: 12 Aug 92

Reference	
Field Activity Daily Log Page(s)	26–28

ENVIRONMENTAL RESTORATION
BOREHOLE LOG

Depth (ft)	Blow Counts	Sample Type	Organics (ppm)	Rad. (cpm)	Lithologic USCS Symbol	Geologic Description
0	4 11 14 20	CA SS 2.0/2.0			SP	0.0 to 2.0; dry, compact, pale yellowish brown (10 YR 6/2) structureless, very fine SAND: EOLIAN DEPOSITS
5	13 39 38 45	CA SS 2.0/2.0			SW	3.0 to 5.0; dry very dense, pale yellowish brown (10 YR 6/2) unstratified, fine to coarse roudned to subrunded SAND, some small to coarse rounded to subangular GRAVEL: FLUVIAL DEPOSITS
10	23 36 39 40	CA SS 1.8/2.0			SW	8.0 to 9.8; dry very dense, pale yellowish brown (10 YR 6/2) unstratified, fine to coarse, rounded to subangular SAND and small to medium rounded to subrounded GRAVEL: FLUVIAL DEPOSITS
15	20 37 66 63	CA SS 2.0/2.0			SW	13.0 to 15.0; dry to damp; very dense, dark yellowish brown (10 YR 4/2) unstratified, medium to coarse rounded to subrounded SAND and small to medium rounded to subrounded GRAVEL: Fluvial Deposits
20	74 123	CA SS 1.0/1.0			SP	18.0 to 19.0: Dry to damp, very dense, dark yellowish brown (10 YR 4/2) unstratified, medium (only) SAND with some small to medium rounded to subrounded GRAVEL: FLUVIAL DEPOSITS TD Hole at 19.0 BGS

ECA: None Location: Background Borehole #4

Drilling Subcontractor: Hawley Brothers (Blackfoot, Idaho)

Borehole Diameter: 8 inches Drill Method 4 inch hollow stem auger

Logged by: Arden Baily (GAI Geolgist) Reviewed by:

Sample Method California split spoon samler driven with a 140 lb hammer

Signature: Date: 12 Aug 92

Reference
Field Activity Daily Log Page(s) 29–30

ENVIRONMENTAL RESTORATION
BOREHOLE LOG

Depth (ft)	Blow Counts	Sample Type	Organics (ppm)	Rad. (cpm)	Lithologic USCS Symbol	Geologic Description
0	10 22 26 27	CA SS 2.0/2.0			SW	0.0 to 2.0; dry, dense, pale yellowish brown (10 YR 4/2) unstratified, fine to coarse, rounded to subrounded SAND and small to medium rounded to subrounded GRAVEL little organics. FLUVIAL DEPOSITS
5	7 22 23 27	CA SS 2.0/2.0			SW	3.0 to 5.0; dry, dense, medium gray (NA) unstratified fine to coarse, rounded to subrounded SAND, and small to medium rounded to subrounded GRAVEL, trace organics: FLUVIAL DEPOSITS
10	23 35 45 50/0.3	CA SS 1.8/1.8			SW	8.0 to 9.8; Dry, very dense, dark yellowish brown (10 YR 6/2) unstratified, fine to coarse, rounded to subrounded SAND and small to medium rounded to subrounded GRAVEL: FLUVIAL DEPOSITS
15	42 63 50/0.2	CA SS 1.2/1.2			SW	13.0 to 14.3; dry to damp, very dense, dark yellowish brown (10 YR 4/2) unstratified, fine to coarse, rounded to subrounded SAND and small to medium rounded to subrounded GRAVEL: FLUVIAL DEPOSITS
20	83 100/0.3	CA SS 0.8/0.8			SW	18.0 to 18.5; dry to damp, very dense, dark yellowish brown (10 YR 6/2) unstratified, fine to coarse, rounded to subrounded SAND and rounded to subrounded small to coarse GRAVEL: FLUVIAL DEPOSITS TD Hole at 18.8 BGS

ECA: None Location: Background Borehole #5

Drilling Subcontractor: Hawley Brothers (Blackfoot, Idaho)

Borehole Diameter: 8 inches Drill Method 4 inch hollow stem auger

Logged by: Arden Baily (GAI Geolgist) Reviewed by:

Sample Method California split spoon samler driven with a 140 lb hammer

Signature: Date: 13 Aug 92

Reference	
Field Activity Daily Log Page(s)	31-33

ENVIRONMENTAL RESTORATION
BOREHOLE LOG

Depth (ft)	Blow Counts	Sample Type	Organics (ppm)	Rad. (cpm)	Lithologic USCS Symbol	Geologic Description
0	9 10 21 17	CA SS 2.0/2.0			ML	0.0 to 2.0; dry, dense, moderate yellowish brown (10 YR 5/2) structureless, SILT, some fine, sand some small rounded to subrounded GRAVEL
5	11 32 38	CA SS 1.5/1.5			SW	3.0 to 4.5; dry, very dense, medium gray (N4) unstratified fine to coarse, rounded to subangular SAND and small to medium rounded to angular GRAVEL: FLUVIAL DEPOSITS
10	28 50/0.2	CA SS 0.7/0.7			SW	8.0 to 8.7; dry , very dense, dark yellowish drown (10 YR 4/2) unstratified fine to coarse, rounded to subrounded SAND and small as medium rounded to subrounded GRAVEL: FLUVIAL DEPOSITS
15	4 31 50/0.2	CA SS 1.2/1.2			ML	13.0 to 14.2; moist, very dense, moderate yellowish brown (10 YR 5/4) structureless SILT – EOLIAN DEPOSITS Angular clasts of vesicular basalts at sample bottom TD Hole at 14.2 BGS on rock
20						

ECA: None Location: Background Borehole #6

Drilling Subcontractor: Hawley Brothers (Blackfoot, Idaho)

Borehole Diameter: 8 inches Drill Method 4 inch hollow stem auger

Logged by: Arden Baily (GAI Geolgist) Reviewed by:

Sample Method California split spoon samler driven with a 140 lb hammer

Signature: Date: 13 Aug 92

APPENDIX B

Form 1 Analytical Data

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

0001MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 0001MT

Matrix (soil/water): SOIL Lab Sample ID: 92005181

Level (low/med): LOW Date Received: 08/24/92

% Solids: 97.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	3.6			F	
7440-39-3	Barium	171			P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.0	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	14.4			P	
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	14.6		NS*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	331		N	P	J
7439-97-6	Mercury	0.05	U		CV	
7440-02-0	Nickel	18.1			P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.21	U	NW	F	UJ
7440-22-4	Silver	0.21	U		F	
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

MHO 2/28/94

Color Before: TAN Clarity Before: Texture: FINE

Color After: LT.YELLOW Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

0101MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 0001MT

Matrix (soil/water): SOIL Lab Sample ID: 92005182

Level (low/med): LOW Date Received: 08/24/92

% Solids: 97.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	5.3			F	
7440-39-3	Barium	143			P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.0	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	14.2			P	
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	14.4		NS*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	173		N	P	J
7439-97-6	Mercury	0.05	B		CV	
7440-02-0	Nickel	18.9			P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.21	U	N	F	UJ
7440-22-4	Silver	2.1	U		F	
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

MHD 2/28/94

Color Before: TAN Clarity Before: Texture: FN/RKY

Color After: LT.YELLOW Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

0201MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 0001MT

Matrix (soil/water): SOIL Lab Sample ID: 92005183

Level (low/med): LOW Date Received: 08/24/92

% Solids: 97.3

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	4.5			F	
7440-39-3	Barium	77.5			P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.0	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	15.2			P	
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	33.3		N*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	185		N	P	J
7439-97-6	Mercury	0.05	U		CV	
7440-02-0	Nickel	16.9			P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.21	U	N	F	UJ
7440-22-4	Silver	0.21	U	W	F	
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

MHD 2/28/94

Color Before: TAN Clarity Before: Texture: FN/RKY

Color After: LT.YELLOW Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

0301MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 0001MT

Matrix (soil/water): SOIL Lab Sample ID: 92005184

Level (low/med): LOW Date Received: 08/24/92

% Solids: 96.6

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	4.0			F	
7440-39-3	Barium	44.7			P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.0	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	16.6			P	
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	13.6		NW*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	154		N	P	J
7439-97-6	Mercury	0.05	U		CV	MHD 2/28/94
7440-02-0	Nickel	17.2			P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.21	U	N	F	UJ
7440-22-4	Silver	0.21	U		F	
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

Color Before: TAN Clarity Before: Texture: FN/RKY

Color After: LT.YELLOW Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

0401MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 0001MT

Matrix (soil/water): SOIL Lab Sample ID: 92005185

Level (low/med): LOW Date Received: 08/24/92

% Solids: 96.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	4.5			F	
7440-39-3	Barium	114			P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.0	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	19.0			P	
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	17.8		NS*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	183		N	P	J MHD 2/28/94
7439-97-6	Mercury	0.05	U		CV	
7440-02-0	Nickel	18.0			P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.21	U	N	F	UJ
7440-22-4	Silver	0.21	U		F	
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

Color Before: TAN Clarity Before: Texture: FN/RKY

Color After: LT.YELLOW Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

0501MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 0001MT

Matrix (soil/water): SOIL Lab Sample ID: 92005186

Level (low/med): LOW Date Received: 08/24/92

% Solids: 95.9

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	5.1			F	
7440-39-3	Barium	88.4			P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.0	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	14.8			P	
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	10.9		NW*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	155		N	P	J
7439-97-6	Mercury	0.05	U		CV	
7440-02-0	Nickel	14.0			P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.21	U	N	F	UJ
7440-22-4	Silver	0.21	U		F	
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

MHD 2/28/94

Color Before: TAN Clarity Before: Texture: FN/RKY

Color After: LT.YELLOW Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

0601MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 0001MT

Matrix (soil/water): SOIL Lab Sample ID: 92005175

Level (low/med): LOW Date Received: 08/24/92

% Solids: 96.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M		
7429-90-5	Aluminum						
7440-36-0	Antimony						
7440-38-2	Arsenic	4.4		S	F		
7440-39-3	Barium	217			P		
7440-41-7	Beryllium						
7440-43-9	Cadmium	1.0	U		P		
7440-70-2	Calcium						
7440-47-3	Chromium	21.3			P		
7440-48-4	Cobalt						
7440-50-8	Copper						
7439-89-6	Iron						
7439-92-1	Lead	16.7		NS*	F	J	MHD 2/28/94
7439-95-4	Magnesium						
7439-96-5	Manganese	387		N	P	J	
7439-97-6	Mercury	0.05	U		CV		
7440-02-0	Nickel	25.0			P		
7440-09-7	Potassium						
7782-49-2	Selenium	0.21	U	NW	F	UJ	
7440-22-4	Silver	2.1	U		F		
7440-23-5	Sodium						
7440-28-0	Thallium						
7440-62-2	Vanadium						
7440-66-6	Zinc						
	Cyanide						

Color Before: TAN Clarity Before: Texture: FN/RKY

Color After: LT.YELLOW Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

0701MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 0001MT

Matrix (soil/water): SOIL Lab Sample ID: 92005176

Level (low/med): LOW Date Received: 08/24/92

% Solids: 98.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	5.1		S	F	
7440-39-3	Barium	83.3			P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.0	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	12.6			P	
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	10.0		NS*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	130		N	P	J MHD 2/28/94
7439-97-6	Mercury	0.05	U		CV	
7440-02-0	Nickel	13.6			P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.20	U	NW	F	UJ
7440-22-4	Silver	0.20	U	W	F	
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

Color Before: GRAY Clarity Before: Texture: FN/RKY

Color After: LT.YELLOW Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

0801MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 0001MT

Matrix (soil/water): SOIL Lab Sample ID: 92005177

Level (low/med): LOW Date Received: 08/24/92

% Solids: 98.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	4.6		S	F	
7440-39-3	Barium	69.8			P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.0	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	19.2			P	
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	13.6		NS*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	145		N	P	J
7439-97-6	Mercury	0.05	U		CV	
7440-02-0	Nickel	18.4			P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.20	U	NW	F	UJ
7440-22-4	Silver	2.0	U		F	
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

Color Before: TAN Clarity Before: Texture: FN/RKY

Color After: LT.YELLOW Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

0901MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 0001MT

Matrix (soil/water): SOIL Lab Sample ID: 92005179

Level (low/med): LOW Date Received: 08/24/92

% Solids: 96.9

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	5.2		S	F	
7440-39-3	Barium	48.9			P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.0	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	12.2			P	
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	11.5		NS*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	123		N	P	J
7439-97-6	Mercury	0.05	U		CV	
7440-02-0	Nickel	12.6			P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.21	U	NW	F	UJ
7440-22-4	Silver	2.1	U		F	
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

MHD 2/28/94

Color Before: BROWN Clarity Before: Texture: FINE

Color After: LT.YELLOW Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

1001MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 0001MT

Matrix (soil/water): SOIL Lab Sample ID: 92005180

Level (low/med): LOW Date Received: 08/24/92

% Solids: 96.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	3.7			F	
7440-39-3	Barium	71.1			P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.0	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	17.4			P	
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	15.8		NS*	F	J MHD 2/28/94
7439-95-4	Magnesium					
7439-96-5	Manganese	174		N	P	J
7439-97-6	Mercury	0.05	U		CV	
7440-02-0	Nickel	21.1			P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.21	U	NW	F	UJ
7440-22-4	Silver	2.1	U		F	
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

Color Before: BROWN Clarity Before: Texture: FN/RKY

Color After: LT.YELLOW Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1101MT

1

INORGANIC ANALYSIS DATA SHEET

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 0001MT

Matrix (soil/water): SOIL Lab Sample ID: 92005178

Level (low/med): LOW Date Received: 08/24/92

% Solids: 98.1

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	3.8			F	
7440-39-3	Barium	68.7			P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.0	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	15.3			P	
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					MHD 2/28/94
7439-92-1	Lead	10.0		NS*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	135		N	P	J
7439-97-6	Mercury	0.05	U		CV	
7440-02-0	Nickel	16.3			P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.20	U	NW	F	UJ
7440-22-4	Silver	2.0	U		F	
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

Color Before: TAN Clarity Before: Texture: FN/RKY

Color After: LT.YELLOW Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

1201MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 0001MT

Matrix (soil/water): SOIL Lab Sample ID: 92005169

Level (low/med): LOW Date Received: 08/24/92

% Solids: 97.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	6.4		S	F	
7440-39-3	Barium	156			P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.0	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	21.6			P	
7440-48-4	Cobalt					MHD 2/28/94
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	10.8		NS*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	195		N	P	J
7439-97-6	Mercury	0.05	U		CV	
7440-02-0	Nickel	24.3			P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.21	U	NW	F	UJ
7440-22-4	Silver	0.21	U	W	F	
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

Color Before: BROWN Clarity Before: Texture: FN/RKY

Color After: LT.YELLOW Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

1301MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 0001MT

Matrix (soil/water): SOIL Lab Sample ID: 92005170

Level (low/med): LOW Date Received: 08/24/92

% Solids: 93.3

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	3.1			F	
7440-39-3	Barium	67.1			P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.1	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	11.8			P	
7440-48-4	Cobalt					MHD 2/28/94
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	7.9		NS*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	144		N	P	J
7439-97-6	Mercury	0.05	U		CV	
7440-02-0	Nickel	13.7			P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.21	U	N	F	UJ
7440-22-4	Silver	0.71	B		F	
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

Color Before: BROWN Clarity Before: Texture: COARSE

Color After: LT.YELLOW Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

1401MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 0001MT

Matrix (soil/water): SOIL Lab Sample ID: 92005172

Level (low/med): LOW Date Received: 08/24/92

% Solids: 98.5

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	3.1			F	
7440-39-3	Barium	73.7			P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.0	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	15.8			P	
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead					
7439-95-4	Magnesium					
7439-96-5	Manganese	124		N	P	J
7439-97-6	Mercury	0.05	U		CV	
7440-02-0	Nickel	14.8			P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.20	U	N	F	UJ
7440-22-4	Silver	2.0	U		F	
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

MHD 2/28/94

Color Before: TAN Clarity Before: Texture: MEDIUM

Color After: LT.YELLOW Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

1501MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 0001MT

Matrix (soil/water): SOIL Lab Sample ID: 92005173

Level (low/med): LOW Date Received: 08/24/92

% Solids: 97.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	3.7			F	
7440-39-3	Barium	99.2			P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.0	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	20.0			P	
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	11.2		NW*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	171		N	P	J
7439-97-6	Mercury	0.05	U		CV	
7440-02-0	Nickel	17.1			P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.21	U	NW	F	UJ
7440-22-4	Silver	0.21	U		F	
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

MHD 2/28/94

Color Before: BROWN Clarity Before: Texture: MD/RKY

Color After: LT.YELLOW Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

1601MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 0001MT

Matrix (soil/water): SOIL Lab Sample ID: 92005174

Level (low/med): LOW Date Received: 08/24/92

% Solids: 81.8

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	6.4		S	F	
7440-39-3	Barium	115			P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.2	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	20.8			P	MHD 2/28/94
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	15.4		N*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	284		N	P	J
7439-97-6	Mercury	0.06	U		CV	
7440-02-0	Nickel	20.3			P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.24	U	NW	F	UJ
7440-22-4	Silver	2.4	U		F	
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: LT.YELLOW Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

1701MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 0001MT

Matrix (soil/water): SOIL Lab Sample ID: 92005171

Level (low/med): LOW Date Received: 08/24/92

% Solids: 83.8

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	4.3			F	
7440-39-3	Barium	104			P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.2	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	25.1			P	
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					MHD 2/28/94
7439-92-1	Lead	8.7		NS*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	196		N	P	J
7439-97-6	Mercury	0.06	U		CV	
7440-02-0	Nickel	22.2			P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.24	U	N	F	UJ
7440-22-4	Silver	0.24	U	W	F	
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

Color Before: BROWN Clarity Before: Texture: FN/RKY

Color After: LT.YELLOW Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

1801MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 1801MT

Matrix (soil/water): SOIL Lab Sample ID: 92005200

Level (low/med): LOW Date Received: 08/24/92

% Solids: 95.9

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	5.4		NS	F	J
7440-39-3	Barium	242			P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.0	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	27.1			P	
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	11.7		N*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	332			P	
7439-97-6	Mercury	0.05	U		CV	
7440-02-0	Nickel	40.3			P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.26	B	NW	F	BJ
7440-22-4	Silver	0.33	B	N	F	BJ
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

NHD 2/28/94

Color Before: BROWN Clarity Before: Texture: FINE

Color After: COLORLESS Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

1901MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 1801MT

Matrix (soil/water): SOIL Lab Sample ID: 92005201

Level (low/med): LOW Date Received: 08/24/92

% Solids: 98.4

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	1.3	B	N	F	BJ
7440-39-3	Barium	28.7	B		P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.0	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	3.5			P	
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	11.1		N*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	60.6			P	
7439-97-6	Mercury	0.05	U		CV	
7440-02-0	Nickel	6.9	B		P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.20	B	NW	F	BJ
7440-22-4	Silver	0.20	U	N	F	UJ
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

MHD 2/28/94

Color Before: GREY Clarity Before: Texture: COURSE

Color After: COLORLESS Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

2001MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 1801MT

Matrix (soil/water): SOIL Lab Sample ID: 92005203

Level (low/med): LOW Date Received: 08/24/92

% Solids: 98.1

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	3.5		NS	F	J
7440-39-3	Barium	76.9			P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.0	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	12.8			P	
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	7.7		N*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	122			P	
7439-97-6	Mercury	0.05	U		CV	
7440-02-0	Nickel	18.6			P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.23	B	NW	F	BJ
7440-22-4	Silver	0.20	U	N	F	UJ
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

MHD 2/28/94

Color Before: GREY Clarity Before: Texture: MEDIUM

Color After: COLORLESS Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

2101MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 1801MT

Matrix (soil/water): SOIL Lab Sample ID: 92005204

Level (low/med): LOW Date Received: 08/24/92

% Solids: 97.9

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	3.0		NS	F	J
7440-39-3	Barium	57.0			P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.0	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	14.1			P	MHD 2/28/94
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	6.6		N*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	127			P	
7439-97-6	Mercury	0.05	U		CV	
7440-02-0	Nickel	20.0			P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.20	U	N	F	UJ
7440-22-4	Silver	0.20	U	N	F	UJ
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

Color Before: GREY Clarity Before: Texture: MEDIUM

Color After: COLORLESS Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

2201MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 1801MT

Matrix (soil/water): SOIL Lab Sample ID: 92005205

Level (low/med): LOW Date Received: 08/24/92

% Solids: 95.4

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	7.5		NS	F	J
7440-39-3	Barium	95.4			P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.0	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	18.2			P	
7440-48-4	Cobalt					MHD 2/28/94
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	15.0		NS*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	237			P	
7439-97-6	Mercury	0.05	U		CV	
7440-02-0	Nickel	25.6			P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.21	U	N	F	UJ
7440-22-4	Silver	0.21	U	N	F	UJ
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: COLORLESS Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

2301MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 1801MT

Matrix (soil/water): SOIL Lab Sample ID: 92005202

Level (low/med): LOW Date Received: 08/24/92

% Solids: 98.6

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	0.41	B	NW	F	BJ
7440-39-3	Barium	30.4	B		P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.0	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	2.0			P	
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	5.6		N*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	67.7			P	
7439-97-6	Mercury	0.05	U		CV	
7440-02-0	Nickel	7.9	B		P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.20	U	NW	F	UJ
7440-22-4	Silver	0.20	U	N	F	UJ
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

WHD 2/28/94

Color Before: GREY Clarity Before: Texture: COURSE

Color After: COLORLESS Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

2401MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 1801MT

Matrix (soil/water): SOIL Lab Sample ID: 92005194

Level (low/med): LOW Date Received: 08/24/92

% Solids: 98.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	2.4		N	F	J
7440-39-3	Barium	164			P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.0	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	13.7			P	MHD 2/28/94
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	10.8		N*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	337			P	
7439-97-6	Mercury	0.05	U		CV	
7440-02-0	Nickel	21.2			P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.20	U	NW	F	UJ
7440-22-4	Silver	0.20	U	N	F	UJ
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

Color Before: BROWN Clarity Before: Texture: FINE

Color After: COLORLESS Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

2501MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 1801MT

Matrix (soil/water): SOIL Lab Sample ID: 92005195

Level (low/med): LOW Date Received: 08/24/92

% Solids: 99.1

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	0.63	B	N	F	BJ
7440-39-3	Barium	32.7	B		P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.0	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	2.6			P	MHD 2/25/94
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	4.3		N*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	61.6			P	
7439-97-6	Mercury	0.05	U		CV	
7440-02-0	Nickel	8.1			P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.20	U	NW	F	UJ
7440-22-4	Silver	0.20	U	N	F	UJ
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

Color Before: GREY Clarity Before: Texture: COURSE

Color After: COLORLESS Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

2601MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 1801MT

Matrix (soil/water): SOIL Lab Sample ID: 92005197

Level (low/med): LOW Date Received: 08/24/92

% Solids: 98.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	4.3		NS	F	J
7440-39-3	Barium	47.3			P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.0	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	11.6			P	
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	10.3		NS*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	120			P	
7439-97-6	Mercury	0.05	U		CV	
7440-02-0	Nickel	15.9			P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.20	U	NW	F	UJ
7440-22-4	Silver	0.20	U	N	F	UJ
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

MHD 2/28/94

Color Before: GREY Clarity Before: Texture: MEDIUM

Color After: COLORLESS Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

2701MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 1801MT

Matrix (soil/water): SOIL Lab Sample ID: 92005198

Level (low/med): LOW Date Received: 08/24/92

% Solids: 96.8

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	5.3		NS	F	J
7440-39-3	Barium	44.4			P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.0	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	10.3			P	
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	12.2		NS*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	88.6			P	
7439-97-6	Mercury	0.05	U		CV	
7440-02-0	Nickel	13.2			P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.21	U	NW	F	UJ
7440-22-4	Silver	0.21	U	N	F	UJ
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

NHD 2/25/94

Color Before: GREY Clarity Before: Texture: MEDIUM

Color After: COLORLESS Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

1

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

2801MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 1801MT

Matrix (soil/water): SOIL Lab Sample ID: 92005199

Level (low/med): LOW Date Received: 08/24/92

% Solids: 95.5

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	3.8		N	F	J
7440-39-3	Barium	109			P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.0	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	19.9			P	
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	13.8		NS*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	226			P	
7439-97-6	Mercury	0.05	U		CV	
7440-02-0	Nickel	22.6			P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.21	U	NW	F	UJ
7440-22-4	Silver	0.21	U	N	F	UJ
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

MHD 2/25/94

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: COLORLESS Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

1

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

2901MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 1801MT

Matrix (soil/water): SOIL Lab Sample ID: 92005196

Level (low/med): LOW Date Received: 08/24/92

% Solids: 98.5

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	0.98	B	NW	F	BJ
7440-39-3	Barium	35.7	B		P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.0	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	1.2	U		P	
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	1.9		N*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	29.2			P	
7439-97-6	Mercury	0.05	U		CV	
7440-02-0	Nickel	4.3	U		P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.20	U	NW	F	UJ
7440-22-4	Silver	0.20	U	N	F	UJ
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

Color Before: GREY Clarity Before: Texture: COURSE

Color After: COLORLESS Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

3001MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 1801MT

Matrix (soil/water): SOIL Lab Sample ID: 92005189

Level (low/med): LOW Date Received: 08/24/92

% Solids: 97.8

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	5.9		N	F	J
7440-39-3	Barium	203			P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.0	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	17.4			P	
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	10.9		N*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	387			P	
7439-97-6	Mercury	0.05	U		CV	
7440-02-0	Nickel	23.3			P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.38	B	NS	F	BJ
7440-22-4	Silver	0.20	U	N	F	UJ
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

MHD 2/25/94

Color Before: BROWN Clarity Before: Texture: FINE

Color After: COLORLESS Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

1

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

3101MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 1801MT

Matrix (soil/water): SOIL Lab Sample ID: 92005190

Level (low/med): LOW Date Received: 08/24/92

% Solids: 98.3

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	1.4	B	N	F	BJ
7440-39-3	Barium	80.0			P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.0	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	9.4			P	MHD 2/26/94
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	5.5		NS*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	132			P	
7439-97-6	Mercury	0.05	U		CV	
7440-02-0	Nickel	15.5			P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.20	U	NW	F	UJ
7440-22-4	Silver	0.20	U	N	F	UJ
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

Color Before: GREY Clarity Before: Texture: FN/RKY

Color After: COLORLESS Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

1

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

3201MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 1801MT

Matrix (soil/water): SOIL Lab Sample ID: 92005191

Level (low/med): LOW Date Received: 08/24/92

% Solids: 86.9

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	1.9	B	N	F	BJ
7440-39-3	Barium	41.9	B		P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.2	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	7.6			P	
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	4.0		N*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	103			P	
7439-97-6	Mercury	0.06	U		CV	
7440-02-0	Nickel	12.7			P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.23	U	NW	F	UJ
7440-22-4	Silver	0.23	U	N	F	UJ
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

MHD 2/28/94

Color Before: GREY Clarity Before: Texture: SANDY

Color After: COLORLESS Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

3301MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 1801MT

Matrix (soil/water): SOIL Lab Sample ID: 92005193

Level (low/med): LOW Date Received: 08/24/92

% Solids: 80.8

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	7.8		NS	F	J
7440-39-3	Barium	260			P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.2	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	21.0			P	
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	10.8		N*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	327			P	
7439-97-6	Mercury	0.06	U		CV	
7440-02-0	Nickel	32.2			P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.25	U	NW	F	UJ
7440-22-4	Silver	0.25	U	N	F	UJ
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

MHD 2/28/94

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: COLORLESS Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

3501MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 1801MT

Matrix (soil/water): SOIL Lab Sample ID: 92005192

Level (low/med): LOW Date Received: 08/24/92

% Solids: 99.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	0.62	B	N	F	BJ
7440-39-3	Barium	24.3	B		P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	1.0	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	5.0			P	MHP 2/28/94
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	1.2		N*	F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	89.7			P	
7439-97-6	Mercury	0.05	U		CV	
7440-02-0	Nickel	15.8			P	
7440-09-7	Potassium					
7782-49-2	Selenium	0.36	B	NW	F	BJ
7440-22-4	Silver	0.20	U	N	F	UJ
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

Color Before: GREY Clarity Before: Texture: COURSE

Color After: COLORLESS Clarity After: Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

3601MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 0001MT

Matrix (soil/water): WATER Lab Sample ID: 92005167

Level (low/med): LOW Date Received: 08/24/92

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	2.0	U		F	UJ
7440-39-3	Barium	2.0	U		P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	7.0			P	
7440-70-2	Calcium					
7440-47-3	Chromium	6.0	U		P	
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	2.0	U		F	UJ
7439-95-4	Magnesium					
7439-96-5	Manganese	4.0	U		P	
7439-97-6	Mercury	0.10	U		CV	
7440-02-0	Nickel	15.0	B		P	
7440-09-7	Potassium					
7782-49-2	Selenium	1.0	U		F	UJ
7440-22-4	Silver	1.0	U		F	UJ
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

NHD 2/28/94

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

3602MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 0001MT

Matrix (soil/water): WATER Lab Sample ID: 92005168

Level (low/med): LOW Date Received: 08/24/92

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum		-		-	
7440-36-0	Antimony		-		-	
7440-38-2	Arsenic	2.0	U		F	UJ
7440-39-3	Barium	2.0	U		P	
7440-41-7	Beryllium		-		-	
7440-43-9	Cadmium	7.0	-		P	
7440-70-2	Calcium		-		-	
7440-47-3	Chromium	6.0	U		P	
7440-48-4	Cobalt		-		-	
7440-50-8	Copper		-		-	
7439-89-6	Iron		-		-	
7439-92-1	Lead	2.0	U		F	UJ
7439-95-4	Magnesium		-		-	
7439-96-5	Manganese	4.0	U		P	
7439-97-6	Mercury	0.10	U		CV	
7440-02-0	Nickel	18.0	B		P	
7440-09-7	Potassium		-		-	
7782-49-2	Selenium	1.0	U		F	UJ
7440-22-4	Silver	1.0	U		F	UJ
7440-23-5	Sodium		-		-	
7440-28-0	Thallium		-		-	
7440-62-2	Vanadium		-		-	
7440-66-6	Zinc		-		-	
	Cyanide		-		-	

MHD 2/28/94

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

3701MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 1801MT

Matrix (soil/water): WATER Lab Sample ID: 92005187

Level (low/med): LOW Date Received: 08/24/92

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	2.0	U		F	
7440-39-3	Barium	2.0	U		P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	5.0	U		P	MHD 2/26/97
7440-70-2	Calcium					
7440-47-3	Chromium	6.0	U		P	
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	3.0			F	J
7439-95-4	Magnesium					
7439-96-5	Manganese	3.0	U		P	UJ
7439-97-6	Mercury	0.10	U		CV	
7440-02-0	Nickel	21.0	U		P	
7440-09-7	Potassium					
7782-49-2	Selenium	1.0	U		F	UJ
7440-22-4	Silver	1.0	U		F	
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

3702MT

Lab Name: TCT St. Louis Contract: ERD-T0S-08

Lab Code: TCT Case No.: T0S08 SAS No.: SDG No.: 1801MT

Matrix (soil/water): WATER Lab Sample ID: 92005188

Level (low/med): LOW Date Received: 08/24/92

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum					
7440-36-0	Antimony					
7440-38-2	Arsenic	2.0	U		F	
7440-39-3	Barium	2.0	U		P	
7440-41-7	Beryllium					
7440-43-9	Cadmium	5.0	U		P	
7440-70-2	Calcium					
7440-47-3	Chromium	6.0	U		P	
7440-48-4	Cobalt					
7440-50-8	Copper					
7439-89-6	Iron					
7439-92-1	Lead	2.0	U		F	UJ
7439-95-4	Magnesium					
7439-96-5	Manganese	3.0	U		P	UJ
7439-97-6	Mercury	0.10	U		CV	
7440-02-0	Nickel	21.0	U		P	
7440-09-7	Potassium					
7782-49-2	Selenium	1.0	U		F	UJ
7440-22-4	Silver	1.0	U		F	
7440-23-5	Sodium					
7440-28-0	Thallium					
7440-62-2	Vanadium					
7440-66-6	Zinc					
	Cyanide					

MHD 2/28/94

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

FORM I

ENVIRONMENTAL RESTORATION PROGRAM

RADIOANALYTICAL ANALYSIS RESULTS

Date: 10/15/92

Lab Name: B&WLVA

Case No.: 03-08

Report No.: 30810001GRA

SDG No.: 30810001

Field Sample No.	Lab Sample ID	Sample Matrix	Anal Type	Sample Value	Sample Error	Units	Anal Date	Sample Date	Sample Size	Yield	Detector ID	DQF	ASI
30810001RN	920338-12	MSOIL	GRA	8.93E+00	1.47E+00	pCi/g	09/26/92	08/11/92	0.1710	100.0	1004094	J	0
30810101RN	920338-23	MSOIL	GRA	7.53E+00	1.22E+00	pCi/g	09/28/92	08/11/92	0.2279	100.0	1004094	J	0
30810201RN	920338-05	MSOIL	GRA	1.26E+01	1.95E+00	pCi/g	09/24/92	08/11/92	0.1624	100.0	1004094	J	0
30810301RN	920338-24	MSOIL	GRA	9.89E+00	1.56E+00	pCi/g	09/28/92	08/11/92	0.1943	100.0	1004094	J	0
30810401RN	920338-06	MSOIL	GRA	ND 4.18E+00	7.51E-01	pCi/g	09/24/92	08/11/92	0.1551	100.0	1004094	UJ	0
30810501RN	920338-11	MSOIL	GRA	9.85E+00	1.64E+00	pCi/g	10/07/92	08/11/92	0.1280	100.0	1004094	J	0
30810601RN	920338-10	MSOIL	GRA	8.50E+00	1.33E+00	pCi/g	09/24/92	08/11/92	0.2693	100.0	1004094	J	0
30810701RN	920338-19	MSOIL	GRA	8.66E+00	1.43E+00	pCi/g	09/27/92	08/11/92	0.1797	100.0	1004094	J	0
30810801RN	920338-20 LV	MSOIL	GRA	6.25E+00	1.05E+00	pCi/g	09/28/92	08/11/92	0.1941	100.0	1004094	J	0
30810901RN	920338-09	MSOIL	GRA	1.00E+01	1.58E+00	pCi/g	09/26/92	08/12/92	0.1953	100.0	1004094	J	0
30811001RN	920338-01	MSOIL	GRA	1.17E+01	1.78E+00	pCi/g	09/23/92	08/12/92	0.2250	100.0	1004094	J	0
30811101RN	920338-02	MSOIL	GRA	7.13E+00	1.19E+00	pCi/g	09/23/92	08/11/92	0.1849	100.0	1004094	J	0
30811201RN	920338-04	MSOIL	GRA	1.49E+01	2.24E+00	pCi/g	09/24/92	08/12/92	0.1929	100.0	1004094	J	0

See Key for Form I.

alpha

Comments:

FORM I

ENVIRONMENTAL RESTORATION PROGRAM

RADIOANALYTICAL ANALYSIS RESULTS

Date: 10/15/92

Lab Name: B&WLVA

Case No.: 03-08

Report No.: 30810001GRA

SDG No.: 30810001

Field Sample No.	Lab Sample ID	Sample Matrix	Anal Type	Sample Value	Sample Error	Units	Anal Date	Sample Date	Sample Size	Yield	Detector ID	DQF	ASI
30811301RN	920338-07	MSOIL	GRA	5.25E+00	9.17E-01	pCi/g	09/24/92	08/12/92	0.1630	100.0	1004094	J	0
30811401RN	920338-03	MSOIL	GRA	1.27E+01	1.93E+00	pCi/g	09/23/92	08/12/92	0.2029	100.0	1004094	J	0
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			alpha	.									

See Key for Form I.

Comments:

FORM I

ENVIRONMENTAL RESTORATION PROGRAM

RADIOANALYTICAL ANALYSIS RESULTS

Date: 10/15/92

Lab Name: B&WLVA

Case No.: 03-08

Report No.: 30810001GRB

SDG No.: 30810001

Field Sample No.	Lab Sample ID	Sample Matrix	Anal Type	Sample Value	Sample Error	Units	Anal Date	Sample Date	Sample Size	Yield	Detector ID	DQF	ASI
30810001RN	920338-12	MSOIL	~~GRB~~	1.84E+01	1.71E+00	pCi/g	09/26/92	08/11/92	0.1710	100.0	1004094		0
30810101RN	920338-23	MSOIL	~~GRB~~	2.25E+01	2.02E+00	pCi/g	09/28/92	08/11/92	0.2279	100.0	1004094		0
30810201RN	920338-05	MSOIL	~~GRB~~	2.30E+01	2.10E+00	pCi/g	09/24/92	08/11/92	0.1624	100.0	1004094		0
30810301RN	920338-24	MSOIL	~~GRB~~	2.51E+01	2.26E+00	pCi/g	09/28/92	08/11/92	0.1943	100.0	1004094		0
30810401RN	920338-06	MSOIL	~~GRB~~	2.08E+01	1.93E+00	pCi/g	09/24/92	08/11/92	0.1551	100.0	1004094		0
30810501RN	920338-11	MSOIL	~~GRB~~	2.12E+01	1.98E+00	pCi/g	10/07/92	08/11/92	0.1280	100.0	1004094		0
30810601RN	920338-10	MSOIL	~~GRB~~	2.39E+01	2.12E+00	pCi/g	09/24/92	08/11/92	0.2693	100.0	1004094		0
30810701RN	920338-19	MSOIL	~~GRB~~	2.43E+01	2.21E+00	pCi/g	09/27/92	08/11/92	0.1797	100.0	1004094		0
30810801RN	920338-20	MSOIL	~~GRB~~	2.26E+01	2.05E+00	pCi/g	09/28/92	08/11/92	0.1941	100.0	1004094		0
30810901RN	920338-09	MSOIL	~~GRB~~	2.27E+01	2.05E+00	pCi/g	09/26/92	08/12/92	0.1953	100.0	1004094		0
30811001RN	920338-01	MSOIL	~~GRB~~	2.02E+01	1.82E+00	pCi/g	09/23/92	08/12/92	0.2250	100.0	1004094		0
30811101RN	920338-02	MSOIL	~~GRB~~	1.83E+01	1.69E+00	pCi/g	09/23/92	08/11/92	0.1849	100.0	1004094		0
30811201RN	920338-04	MSOIL	~~GRB~~	2.29E+01	2.07E+00	pCi/g	09/24/92	08/12/92	0.1929	100.0	1004094		0

See Key for Form I.

↑ beta

Comments:

FORM I

ENVIRONMENTAL RESTORATION PROGRAM

RADIOANALYTICAL ANALYSIS RESULTS

Date: 10/15/92

Lab Name: B&WLVA

Case No.: 03-08

Report No.: 30810001GRB

SDG No.: 30810001

Field Sample No.	Lab Sample ID	Sample Matrix	Anal Type	Sample Value	Sample Error	Units	Anal Date	Sample Date	Sample Size	Yield	Detector ID	DQF	ASI
30811301RN	920338-07	MSOIL	~~GRB~~	1.99E+01	1.84E+00	pCi/g	09/24/92	08/12/92	0.1630	100.0	1004094		0
30811401RN	920338-03	MSOIL	~~GRB~~ ↑ beta	2.43E+01	2.18E+00	pCi/g	09/23/92	08/12/92	0.2029	100.0	1004094		0

See Key for Form I.

Comments:

FORM I

ENVIRONMENTAL RESTORATION PROGRAM

RADIOANALYTICAL ANALYSIS RESULTS

Date: 10/15/92

Lab Name: B&WLVA

Case No.: 03-08

Report No.: 30810001GMS

SDG No.: 30810001

Field Sample No.	Lab Sample ID	Sample Matrix	Anal Type	Sample Value	Sample Error	Units	Anal Date	Sample Date	Sample Size	Yield	Detector ID	DQF	ASI
30810001RN	920338-12	MSOIL	Cs-137	ND	ND	pCi/g	09/19/92	08/11/92	528.0000	100.0	9912821	U	0
30810101RN	920338-23	MSOIL	Cs-137	1.87E-02	3.90E-03	pCi/g	09/22/92	08/11/92	560.0000	100.0	1922886	J	0
30810201RN	920338-05	MSOIL	Cs-137	ND	ND	pCi/g	09/21/92	08/11/92	500.0000	100.0	23P54W	U	0
30810301RN	920338-24	MSOIL	Cs-137	3.44E-02	4.82E-03	pCi/g	09/24/92	08/11/92	604.0000	100.0	7912802		0
30810401RN	920338-06	MSOIL	Cs-137	ND	ND	pCi/g	09/20/92	08/11/92	549.0000	100.0	9912821	U	0
30810501RN	920338-11	MSOIL	Cs-137	ND	ND	pCi/g	09/21/98	08/11/92	519.0000	100.0	10911272	U	0
30810601RN	920338-10	MSOIL	Cs-137	6.69E-01	5.15E-02	pCi/g	09/20/92	08/11/92	512.0000	100.0	1922886	J	0
30810701RN	920338-19	MSOIL	Cs-137	7.21E-02	9.83E-03	pCi/g	09/23/92	08/11/92	166.0000	100.0	1922886	J	0
30810801RN	920338-20	MSOIL	Cs-137	7.61E-02	6.48E-03	pCi/g	09/23/92	08/11/92	663.0000	100.0	10911272		0
30810901RN	920338-09	MSOIL	Cs-137	ND	ND	pCi/g	09/22/92	08/12/92	554.0000	100.0	10911272	U	0
30811001RN	920338-01	MSOIL	Cs-137	ND	ND	pCi/g	09/20/92	08/12/92	639.0000	100.0	7912802	U	0
30811101RN	920338-02	MSOIL	Cs-137	ND	ND	pCi/g	09/21/92	08/11/92	609.0000	100.0	7912802	U	0
30811201RN	920338-04	MSOIL	Cs-137	5.83E-02	5.16E-03	pCi/g	09/21/92	08/12/92	609.0000	100.0	9912821		0

See Key for Form I.

Comments:

FORM I

ENVIRONMENTAL RESTORATION PROGRAM

RADIOANALYTICAL ANALYSIS RESULTS

Date: 10/15/92

Lab Name: B&WLVA

Case No.: 03-08

Report No.: 30810001GMS

SDG No.: 30810001

Field Sample No.	Lab Sample ID	Sample Matrix	Anal Type	Sample Value	Sample Error	Units	Anal Date	Sample Date	Sample Size	Yield	Detector ID	DQF	ASI
30811301RN	920338-07	MSOIL	Cs-137	7.82E-02	7.20E-03	pCi/g	09/21/92	08/12/92	510.0000	100.0	1922886	J	0
30811401RN	920338-03	MSOIL	Cs-137	ND	ND	pCi/g	09/18/92	08/12/92	511.0000	100.0	9912821	U	0
30810001RN	920338-12	MSOIL	K-40	1.84E+01	8.91E-01	pCi/g	09/19/92	08/11/92	528.0000	100.0	9912821		0
30810101RN	920338-23	MSOIL	K-40	1.83E+01	8.73E-01	pCi/g	09/22/92	08/11/92	560.0000	100.0	1922886	J	0
30810201RN	920338-05	MSOIL	K-40	1.78E+01	9.71E-01	pCi/g	09/21/92	08/11/92	500.0000	100.0	23P54W		0
30810301RN	920338-24	MSOIL	K-40	1.98E+01	9.41E-01	pCi/g	09/24/92	08/11/92	604.0000	100.0	7912802		0
30810401RN	920338-06	MSOIL	K-40	1.92E+01	9.27E-01	pCi/g	09/20/92	08/11/92	549.0000	100.0	9912821		0
30810501RN	920338-11	MSOIL	K-40	2.21E+01	1.07E+00	pCi/g	09/21/98	08/11/92	519.0000	100.0	10911272		0
30810601RN	920338-10	MSOIL	K-40	1.97E+01	9.38E-01	pCi/g	09/20/92	08/11/92	512.0000	100.0	1922886	J	0
30810701RN	920338-19	MSOIL	K-40	1.64E+01	8.23E-01	pCi/g	09/23/92	08/11/92	166.0000	100.0	1922886	J	0
30810801RN	920338-20	MSOIL	K-40	1.84E+01	8.95E-01	pCi/g	09/23/92	08/11/92	663.0000	100.0	10911272		0
30810901RN	920338-09	MSOIL	K-40	2.14E+01	1.04E+00	pCi/g	09/22/92	08/12/92	554.0000	100.0	10911272		0
30811001RN	920338-01	MSOIL	K-40	1.69E+01	8.04E-01	pCi/g	09/20/92	08/12/92	639.0000	100.0	7912802		0

See Key for Form I.

Comments:

FORM I

ENVIRONMENTAL RESTORATION PROGRAM

RADIOANALYTICAL ANALYSIS RESULTS

Date: 10/15/92

Lab Name: B&WLVA

Case No.: 03-08

Report No.: 30810001GMS

SDG No.: 30810001

Field Sample No.	Lab Sample ID	Sample Matrix	Anal Type	Sample Value	Sample Error	Units	Anal Date	Sample Date	Sample Size	Yield	Detector ID	DQF	ASI
30811101RN	920338-02	MSOIL	K-40	1.80E+01	8.55E-01	pCi/g	09/21/92	08/11/92	609.0000	100.0	7912802		0
30811201RN	920338-04	MSOIL	K-40	2.03E+01	9.79E-01	pCi/g	09/21/92	08/12/92	609.0000	100.0	9912821		0
30811301RN	920338-07	MSOIL	K-40	1.93E+01	9.18E-01	pCi/g	09/21/92	08/12/92	510.0000	100.0	1922886	J	0
30811401RN	920338-03	MSOIL	K-40	1.92E+01	3.42E-01	pCi/g	09/18/92	08/12/92	511.0000	100.0	9912821		0

See Key for Form I.

Comments:

FORM I

ENVIRONMENTAL RESTORATION PROGRAM

RADIOANALYTICAL ANALYSIS RESULTS

Date: 10/15/92

Lab Name: B&WLVA

Case No.: 03-08

Report No.: 30811501GRA

SDG No.: 30811501

Field Sample No.	Lab Sample ID	Sample Matrix	Anal Type	Sample Value	Sample Error	Units	Anal Date	Sample Date	Sample Size	Yield	Detector ID	DQF	ASI
30811501RN	920338-08	MSOIL	GRA	1.22E+01	1.89E+00	pCi/g	09/24/92	08/12/92	0.1811	100.0	1004094		0
30811601RN	920338-13	MSOIL	GRA	1.66E+01	2.46E+00	pCi/g	09/26/92	08/12/92	0.1872	100.0	1004094		0
30811701RN	920338-14	MSOIL	GRA	8.55E+00	1.38E+00	pCi/g	09/27/92	08/12/92	0.1929	100.0	1004094		0
30811801RN	920338-16	MSOIL	GRA	1.60E+01	2.31E+00	pCi/g	09/24/92	08/12/92	0.3167	100.0	1004094		0
30811901RN	920338-18	MSOIL	GRA	8.45E+00	1.34E+00	pCi/g	09/27/92	08/12/92	0.2283	100.0	1004094		0
30812001RN	920338-17	MSOIL	GRA	1.10E+01	1.68E+00	pCi/g	09/29/92	08/12/92	0.2461	100.0	1004094		0
30812101RN	920338-21	MSOIL	GRA	1.03E+01	1.57E+00	pCi/g	09/28/92	08/13/92	0.3020	100.0	1004094		0
30812201RN	920338-22	MSOIL	GRA	7.56E+00	1.17E+00	pCi/g	09/28/92	08/13/92	0.3068	100.0	1004094		0
30812301RN	920338-15	MSOIL	GRA	6.16E+00	1.05E+00	pCi/g	09/27/92	08/12/92	0.1909	100.0	1004094		0
30813701RN	920337-02	NWATER	GRA	-3.19E-01	-8.64E-02	pCi/L	09/18/92	08/13/92	0.5000	100.0	1004094	U	0
30813702RN	920337-01	NWATER	GRA	-3.65E-01	-1.01E-01	pCi/L	09/18/92	08/13/92	0.5000	100.0	1004094	U	0
			alpha										

See Key for Form I.

Comments:

FORM I

ENVIRONMENTAL RESTORATION PROGRAM

RADIOANALYTICAL ANALYSIS RESULTS

Date: 10/15/92

Lab Name: B&WLVA

Case No.: 03-08

Report No.: 30811501GRB

SDG No.: 30811501

Field Sample No.	Lab Sample ID	Sample Matrix	Anal Type	Sample Value	Sample Error	Units	Anal Date	Sample Date	Sample Size	Yield	Detector ID	DQF	ASL
30811501RN	920338-08	MSOIL	GRB	2.15E+01	1.96E+00	pCi/g	09/24/92	08/12/92	0.1811	100.0	1004094		0
30811601RN	920338-13	MSOIL	GRB	2.61E+01	2.34E+00	pCi/g	09/26/92	08/12/92	0.1872	100.0	1004094		0
30811701RN	920338-14	MSOIL	GRB	1.97E+01	1.81E+00	pCi/g	09/27/92	08/12/92	0.1929	100.0	1004094		0
30811801RN	920338-16	MSOIL	GRB	3.05E+01	2.65E+00	pCi/g	09/24/92	08/12/92	0.3167	100.0	1004094		0
30811901RN	920338-18	MSOIL	GRB	2.20E+01	1.98E+00	pCi/g	09/27/92	08/12/92	0.2283	100.0	1004094		0
30812001RN	920338-17	MSOIL	GRB	2.39E+01	2.12E+00	pCi/g	09/29/92	08/12/92	0.2461	100.0	1004094		0
30812101RN	920338-21	MSOIL	GRB	2.21E+01	1.96E+00	pCi/g	09/28/92	08/13/92	0.3020	100.0	1004094		0
30812201RN	920338-22	MSOIL	GRB	2.87E+01	2.49E+00	pCi/g	09/28/92	08/13/92	0.3068	100.0	1004094		0
30812301RN	920338-15	MSOIL	GRB	1.95E+01	1.79E+00	pCi/g	09/27/92	08/12/92	0.1909	100.0	1004094		0
30813701RN	920337-02	NWATER	GRB	-9.21E-02	-1.01E-02	pCi/L	09/18/92	08/13/92	0.5000	100.0	1004094	U	0
30813702RN	920337-01	NWATER	GRB	1.08E-01	1.18E-02	pCi/L	09/18/92	08/13/92	0.5000	100.0	1004094	U	0
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See Key for Form I.

Comments: _____

FORM I

ENVIRONMENTAL RESTORATION PROGRAM

RADIOANALYTICAL ANALYSIS RESULTS

Date: 10/15/92

Lab Name: B&WLVA

Case No.: 03-08

Report No.: 30811501GMS

SDG No.: 30811501

Field Sample No.	Lab Sample ID	Sample Matrix	Anal Type	Sample Value	Sample Error	Units	Anal Date	Sample Date	Sample Size	Yield	Detector ID	DQF	ASI
30811501RN	920338-08	MSOIL	Cs-137	ND	ND	pCi/g	09/20/92	08/12/92	511.0000	100.0	23P54W	U	0
30811601RN	920338-13	MSOIL	Cs-137	ND	ND	pCi/g	09/23/92	08/12/92	574.0000	100.0	7912802	U	0
30811701RN	920338-14	MSOIL	Cs-137	1.09E-01	1.02E-02	pCi/g	09/22/92	08/12/92	501.0000	100.0	7912802		0
30811801RN	920338-16	MSOIL	Cs-137	1.21E+00	1.03E-01	pCi/g	09/19/92	08/12/92	502.0000	100.0	7912802		0
30811901RN	920338-18	MSOIL	Cs-137	1.61E-01	1.40E-02	pCi/g	09/23/92	08/12/92	632.0000	100.0	23P54W		0
30812001RN	920338-17	MSOIL	Cs-137	1.63E-02	4.20E-03	pCi/g	09/23/92	08/12/92	664.0000	100.0	9912821		0
30812101RN	920338-21	MSOIL	Cs-137	ND	ND	pCi/g	09/22/92	08/13/92	538.0000	100.0	23P54W	U	0
30812201RN	920338-22	MSOIL	Cs-137	ND	ND	pCi/g	09/19/92	08/13/92	423.0000	100.0	23P54W	U	0
30812301RN	920338-15	MSOIL	Cs-137	9.31E-02	7.85E-03	pCi/g	09/22/92	08/12/92	551.0000	100.0	9912821		0
30813701RN	920337-02	NWATER	Cs-137	ND	ND	pCi/L	09/16/92	08/13/92	0.5000	100.0	9912821	U	0
30813702RN	920337-01	NWATER	Cs-137	ND	ND	pCi/L	09/16/92	08/13/92	0.5000	100.0	7912802	U	0
30811501RN	920338-08	MSOIL	K-40	1.77E+01	9.72E-01	pCi/g	09/20/92	08/12/92	511.0000	100.0	23P54W		0
30811601RN	920338-13	MSOIL	K-40	2.64E+01	1.25E+00	pCi/g	09/23/92	08/12/92	574.0000	100.0	7912802		0

See Key for Form I.

Comments: _____

FORM I

ENVIRONMENTAL RESTORATION PROGRAM

RADIOANALYTICAL ANALYSIS RESULTS

Date: 10/15/92

Lab Name: B&WLVA

Case No.: 03-08

Report No.: 30811501GMS

SDG No.: 30811501

Field Sample No.	Lab Sample ID	Sample Matrix	Anal Type	Sample Value	Sample Error	Units	Anal Date	Sample Date	Sample Size	Yield	Detector ID	DQF	ASI
30811701RN	920338-14	MSOIL	K-40	1.96E+01	9.31E-01	pCi/g	09/22/92	08/12/92	501.0000	100.0	7912802		0
30811801RN	920338-16	MSOIL	K-40	2.18E+01	1.04E+00	pCi/g	09/19/92	08/12/92	502.0000	100.0	7912802		0
30811901RN	920338-18	MSOIL	K-40	1.72E+01	9.40E-01	pCi/g	09/23/92	08/12/92	632.0000	100.0	23P54W		0
30812001RN	920338-17	MSOIL	K-40	1.85E+01	8.94E-01	pCi/g	09/23/92	08/12/92	664.0000	100.0	9912821		0
30812101RN	920338-21	MSOIL	K-40	1.83E+01	1.00E+00	pCi/g	09/22/92	08/13/92	538.0000	100.0	23P54W		0
30812201RN	920338-22	MSOIL	K-40	2.30E+01	1.26E+00	pCi/g	09/19/92	08/13/92	423.0000	100.0	23P54W		0
30812301RN	920338-15	MSOIL	K-40	1.68E+01	8.13E-01	pCi/g	09/22/92	08/12/92	551.0000	100.0	9912821		0
30813701RN	920337-02	NWATER	K-40	ND	ND	pCi/L	09/16/92	08/13/92	0.5000	100.0	9912821	U	0

See Key for Form I.

Comments:

ORM I

ENVIRONMENTAL RESTORATION PROGRAM

RADIOANALYTICAL ANALYSIS RESULTS

Date: 10/30/92

Lab Name: B&WLVA

Case No.: 03-08

Report No.: 30806402GRA

SDG No.: 30806402

Field Sample No.	Lab Sample ID	Sample Matrix	Anal Type	Sample Value	Sample Error	Units	Anal Date	Sample Date	Sample Size	Yield	Detector ID	DQF	ASL
30806402RN	920354-02	NWATER	GRA	-2.36E-01	-6.25E-02	pCi/L	10/09/92	08/26/92	0.5000	100.0	1004094		0
30806404RN	920354-01	NWATER	GRA	-3.53E-02	-8.12E-03	pCi/L	10/08/92	09/16/92	0.5000	100.0	1004094		0
30806502RN	920354-03	NWATER	GRA	-2.41E-01	-6.25E-02	pCi/L	10/09/92	08/26/92	0.5000	100.0	1004094		0
30806504RN	920354-04	NWATER	GRA	-2.95E-01	-7.97E-02	pCi/L	10/09/92	09/16/92	0.5000	100.0	1004094		0
30812401RN	920355-07	MSOIL	GRA	1.05E+01	1.64E+00	pCi/g	10/15/92	08/13/92	0.1924	100.0	1004094		0
30812501RN	920355-08	MSOIL	GRA	8.06E+00	1.32E+00	pCi/g	10/16/92	08/13/92	0.1788	100.0	1004094		0
30812601RN	920355-01	MSOIL	GRA	1.17E+01	1.87E+00	pCi/g	10/13/92	08/13/92	0.1377	100.0	1004094		0
30812701RN	920355-05	MSOIL	GRA	1.22E+01	1.87E+00	pCi/g	10/15/92	08/13/92	0.1943	100.0	1004094		0
30812801RN	920355-06	MSOIL	GRA	1.52E+01	2.25E+00	pCi/g	10/15/92	08/13/92	0.1927	100.0	1004094		0
30812901RN	920355-02	MSOIL	GRA	1.16E+01	1.79E+00	pCi/g	10/13/92	08/13/92	0.2013	100.0	1004094		0
30813001RN	920355-09	MSOIL	GRA	5.37E+00	9.20E-01	pCi/g	10/16/92	08/13/92	0.1748	100.0	1004094		0
30813101RN	920355-10	MSOIL	GRA	1.04E+01	1.62E+00	pCi/g	10/16/92	08/13/92	0.2087	100.0	1004094		0
30813201RN	920355-11	MSOIL	GRA	1.08E+01	1.69E+00	pCi/g	10/16/92	08/13/92	0.2231	100.0	1004094		0

See Key for Form I.

Comments:

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ENVIRONMENTAL RESTORATION PROGRAM

RADIOANALYTICAL ANALYSIS RESULTS

Date: 10/30/92

Case No.: 03-08

SDG No.: 30806402

Lab Name: B&WLVA

Report No.: 30806402GRA

Field Sample No.	Lab Sample ID	Sample Matrix	Anal Type	Sample Value	Sample Error	Units	Anal Date	Sample Date	Sample Size	Yield	Detector ID	DQF	ASL
30813301RN	920355-03	MSOIL	GRA	5.50E-01	1.14E-01	pCi/g	10/13/92	08/13/92	0.1697	100.0	1004094		0
30813501RN	920355-04	MSOIL	GRA	8.87E+00	1.43E+00	pCi/g	10/13/92	08/13/92	0.1869	100.0	1004094		0
30813601RN	920354-05	NWATER	GRA	2.02E-01	4.28E-02	pCi/L	10/09/92	08/13/92	0.5000	100.0	1004094		0
30813602RN	920354-06	NWATER	GRA	2.06E-02	4.67E-03	pCi/L	10/09/92	08/13/92	0.5000	100.0	1004094		0

See Key for Form I.

Comments:

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ENVIRONMENTAL RESTORATION PROGRAM

RADIOANALYTICAL ANALYSIS RESULTS

Date: 10/30/92

Lab Name: B&WLVA

Case No.: 03-08

Report No.: 30806402GRB

SDG No.: 30806402

Field Sample No.	Lab Sample ID	Sample Matrix	Anal Type	Sample Value	Sample Error	Units	Anal Date	Sample Date	Sample Size	Yield	Detector ID	DQF	ASL
30806402RN	920354-02	NWATER	GRB	-3.94E-01	-4.45E-02	pCi/L	10/09/92	08/26/92	0.5000	100.0	1004094		0
30806404RN	920354-01	NWATER	GRB	4.82E-01	5.10E-02	pCi/L	10/08/92	09/16/92	0.5000	100.0	1004094		0
30806502RN	920354-03	NWATER	GRB	3.16E-01	3.39E-02	pCi/L	10/09/92	08/26/92	0.5000	100.0	1004094		0
30806504RN	920354-04	NWATER	GRB	5.09E-02	5.55E-03	pCi/L	10/09/92	09/16/92	0.5000	100.0	1004094		0
30812401RN	920355-07	MSOIL	GRB	2.51E+01	2.26E+00	pCi/g	10/15/92	08/13/92	0.1924	100.0	1004094		0
30812501RN	920355-08	MSOIL	GRB	2.53E+01	2.29E+00	pCi/g	10/16/92	08/13/92	0.1788	100.0	1004094		0
30812601RN	920355-01	MSOIL	GRB	2.62E+01	2.40E+00	pCi/g	10/13/92	08/13/92	0.1377	100.0	1004094		0
30812701RN	920355-05	MSOIL	GRB	2.54E+01	2.28E+00	pCi/g	10/15/92	08/13/92	0.1943	100.0	1004094		0
30812801RN	920355-06	MSOIL	GRB	2.69E+01	2.40E+00	pCi/g	10/15/92	08/13/92	0.1927	100.0	1004094		0
30812901RN	920355-02	MSOIL	GRB	2.57E+01	2.30E+00	pCi/g	10/13/92	08/13/92	0.2013	100.0	1004094		0
30813001RN	920355-09	MSOIL	GRB	2.50E+01	2.27E+00	pCi/g	10/16/92	08/13/92	0.1748	100.0	1004094		0
30813101RN	920355-10	MSOIL	GRB	2.30E+01	2.07E+00	pCi/g	10/16/92	08/13/92	0.2087	100.0	1004094		0
30813201RN	920355-11	MSOIL	GRB	1.74E+01	1.59E+00	pCi/g	10/16/92	08/13/92	0.2231	100.0	1004094		0

See Key for Form I.

Comments:

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ENVIRONMENTAL RESTORATION PROGRAM

RADIOANALYTICAL ANALYSIS RESULTS

Date: 10/30/92

Lab Name: B&WLVA

Case No.: 03-08

Report No.: 30806402GRB

SDG No.: 30806402

Field Sample No.	Lab Sample ID	Sample Matrix	Anal Type	Sample Value	Sample Error	Units	Anal Date	Sample Date	Sample Size	Yield	Detector ID	DQF	ASL
30813301RN	920355-03	MSOIL	GRB	1.37E+01	1.31E+00	pCi/g	10/13/92	08/13/92	0.1697	100.0	1004094		0
30813501RN	920355-04	MSOIL	GRB	2.49E+01	2.25E+00	pCi/g	10/13/92	08/13/92	0.1869	100.0	1004094		0
30813601RN	920354-05	NWATER	GRB	-7.79E-02	-8.53E-03	pCi/L	10/09/92	08/13/92	0.5000	100.0	1004094		0
30813602RN	920354-06	NWATER	GRB	-8.61E-02	-9.45E-03	pCi/L	10/09/92	08/13/92	0.5000	100.0	1004094		0

See Key for Form I.

Comments:

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ENVIRONMENTAL RESTORATION PROGRAM

RADIOANALYTICAL ANALYSIS RESULTS

Date: 10/30/92

Case No.: 03-08

Lab Name: B&WLVA

SDG No.: 30806402

Report No.: 30806402GMS

Field Sample No.	Lab Sample ID	Sample Matrix	Anal Type	Sample Value	Sample Error	Units	Anal Date	Sample Date	Sample Size	Yield	Detector ID	DQF	ASL
30806402RN	920354-02	NWATER	Cs-137	ND	ND	pCi/L	09/28/92	08/26/92	0.5000	100.0	9912821		0
30806404RN	920354-01	NWATER	Cs-137	ND	ND	pCi/L	09/28/92	09/16/92	0.5000	100.0	7912802		0
30806502RN	920354-03	NWATER	Cs-137	ND	ND	pCi/L	09/28/92	08/26/92	0.5000	100.0	10911272		0
30806504RN	920354-04	NWATER	Cs-137	ND	ND	pCi/L	09/28/92	09/16/92	0.5000	100.0	23P54W		0
30812401RN	920355-07	MSOIL	Cs-137	5.56E-01	4.05E-02	pCi/g	10/09/92	08/13/92	545.0000	100.0	10911272		0
30812501RN	920355-08	MSOIL	Cs-137	3.18E-01	2.48E-01	pCi/g	10/09/92	08/13/92	560.0000	100.0	23P54W		0
30812601RN	920355-01	MSOIL	Cs-137	1.35E+00	9.75E-02	pCi/g	10/07/92	08/13/92	512.0000	100.0	10911272		0
30812701RN	920355-05	MSOIL	Cs-137	3.03E-01	2.60E-02	pCi/g	10/09/92	08/13/92	541.0000	100.0	7912802		0
30812801RN	920355-06	MSOIL	Cs-137	6.99E-01	4.82E-02	pCi/g	10/09/92	08/13/92	550.0000	100.0	9912821		0
30812901RN	920355-02	MSOIL	Cs-137	8.37E-01	6.06E-02	pCi/g	10/08/92	08/13/92	515.0000	100.0	10911272		0
30813001RN	920355-09	MSOIL	Cs-137	5.45E-01	4.20E-02	pCi/g	10/09/92	08/13/92	502.0000	100.0	1922806		0
30813101RN	920355-10	MSOIL	Cs-137	3.81E-01	2.66E-02	pCi/g	10/10/92	08/13/92	592.0000	100.0	9912821		0
30813201RN	920355-11	MSOIL	Cs-137	1.78E-01	1.56E-02	pCi/g	10/10/92	08/13/92	583.0000	100.0	7912802		0

See Key for Form I.

Comments:

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ENVIRONMENTAL RESTORATION PROGRAM

RADIOANALYTICAL ANALYSIS RESULTS

Date: 10/30/92

Case No.: 03-08

SDG No.: 30806402

Lab Name: B&WLVA

Report No.: 30806402GMS

Field Sample No.	Lab Sample ID	Sample Matrix	Anal Type	Sample Value	Sample Error	Units	Anal Date	Sample Date	Sample Size	Yield	Detector ID	DQF	ASL
30813301RN	920355-03	MSOIL	Cs-137	6.60E-01	4.96E-02	pCi/g	10/08/92	08/13/92	422.0000	100.0	23P54W		0
30813501RN	920355-04	MSOIL	Cs-137	6.46E-01	4.97E-02	pCi/g	10/08/92	08/13/92	513.0000	100.0	1922886		0
30813601RN	920354-05	NWATER	Cs-137	ND	ND	pCi/L	09/28/92	08/13/92	0.5000	100.0	1922886		0
30813602RN	920354-06	NWATER	Cs-137	ND	ND	pCi/L	09/29/92	08/13/92	0.5000	100.0	9912821		0
30806402RN	920354-02	NWATER	K-40	ND	ND	pCi/L	09/28/92	08/26/92	0.5000	100.0	9912821		0
30806404RN	920354-01	NWATER	K-40	ND	ND	pCi/L	09/28/92	09/16/92	0.5000	100.0	7912802		0
30806502RN	920354-03	NWATER	K-40	ND	ND	pCi/L	09/28/92	08/26/92	0.5000	100.0	10911272		0
30806504RN	920354-04	NWATER	K-40	ND	ND	pCi/L	09/28/92	09/16/92	0.5000	100.0	23P54W		0
30812401RN	920355-07	MSOIL	K-40	2.19E+01	1.06E+00	pCi/g	10/09/92	08/13/92	545.0000	100.0	10911272		0
30812501RN	920355-08	MSOIL	K-40	1.80E+01	9.23E-01	pCi/g	10/09/92	08/13/92	560.0000	100.0	23P54W		0
30812601RN	920355-01	MSOIL	K-40	2.00E+01	9.74E-01	pCi/g	10/07/92	08/13/92	512.0000	100.0	10911272		0
30812701RN	920355-05	MSOIL	K-40	2.12E+01	1.01E+00	pCi/g	10/09/92	08/13/92	541.0000	100.0	7912802		0
30812801RN	920355-06	MSOIL	K-40	1.83E+01	8.86E-01	pCi/g	10/09/92	08/13/92	550.0000	100.0	9912821		0

See Key for Form I.

Comments:

ORM I

ENVIRONMENTAL RESTORATION PROGRAM

RADIOANALYTICAL ANALYSIS RESULTS

Date: 10/30/92

Lab Name: B&WLVA

Case No.: 03-08

Report No.: 30806402GMS

SDG No.: 30806402

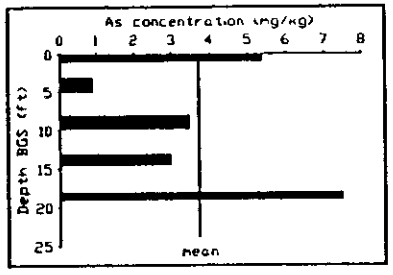
Field Sample No.	Lab Sample ID	Sample Matrix	Anal Type	Sample Value	Sample Error	Units	Anal Date	Sample Date	Sample Size	Yield	Detector ID	DQF	ASL
30812901RN	920355-02	MSOIL	K-40	1.98E+01	9.64E-01	pCi/g	10/08/92	08/13/92	515.0000	100.0	10911272		0
30813001RN	920355-09	MSOIL	K-40	2.05E+01	9.74E-01	pCi/g	10/09/92	08/13/92	502.0000	100.0	1922886		0
30813101RN	920355-10	MSOIL	K-40	1.69E+01	8.20E-01	pCi/g	10/10/92	08/13/92	592.0000	100.0	9912821		0
30813201RN	920355-11	MSOIL	K-40	1.90E+01	9.04E-01	pCi/g	10/10/92	08/13/92	583.0000	100.0	7912802		0
30813301RN	920355-03	MSOIL	K-40	1.37E+01	7.62E-01	pCi/g	10/08/92	08/13/92	422.0000	100.0	23P54W		0
30813501RN	920355-04	MSOIL	K-40	1.95E+01	9.30E-01	pCi/g	10/08/92	08/13/92	513.0000	100.0	1922886		0
30813601RN	920354-05	NWATER	K-40	ND	ND	pCi/L	09/28/92	08/13/92	0.5000	100.0	1922886		0
30813602RN	920354-06	NWATER	K-40	ND	ND	pCi/L	09/29/92	08/13/92	0.5000	100.0	9912821		0

See Key for Form I.

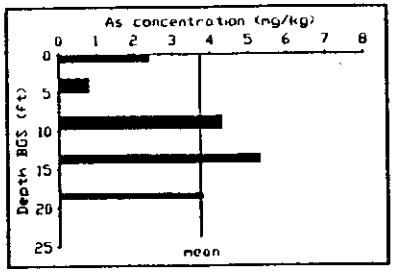
Comments:

APPENDIX C

Concentration Distribution Maps

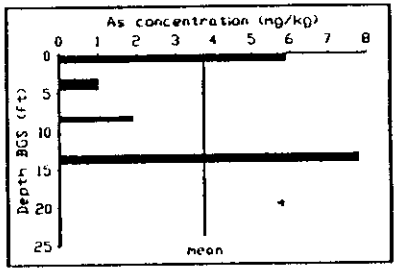


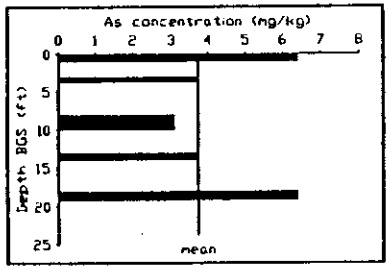
BK - 4



BK - 5

BK - 6





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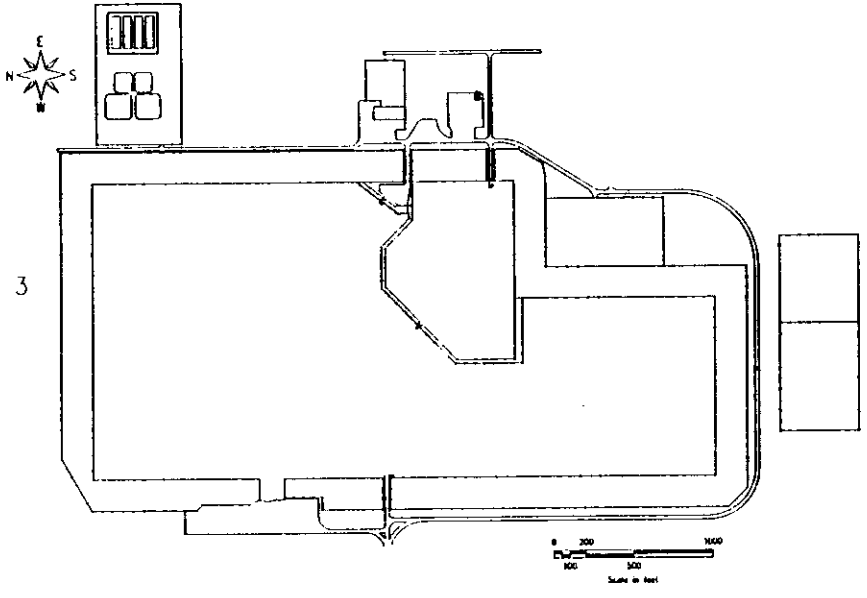

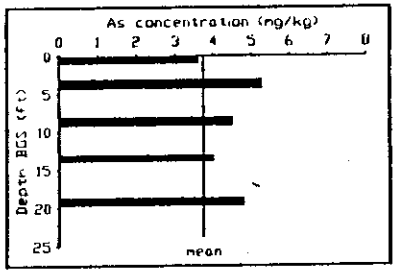

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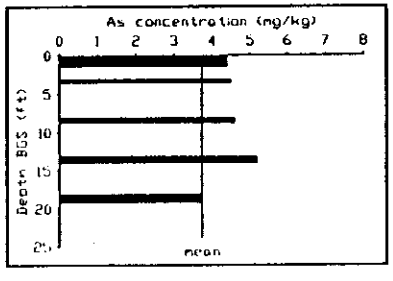
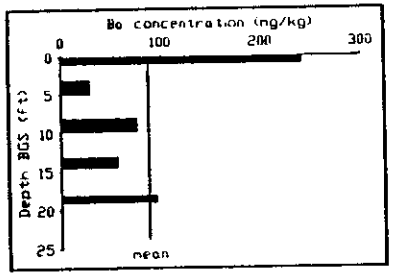
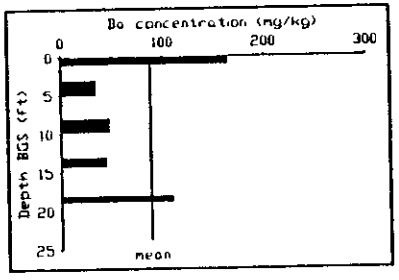


BK - 2

ARSENIC CONCENTRATIONS
FOR THE ICPP ALLUVIUM

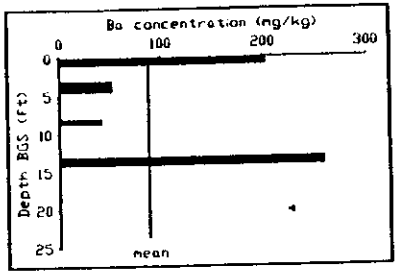


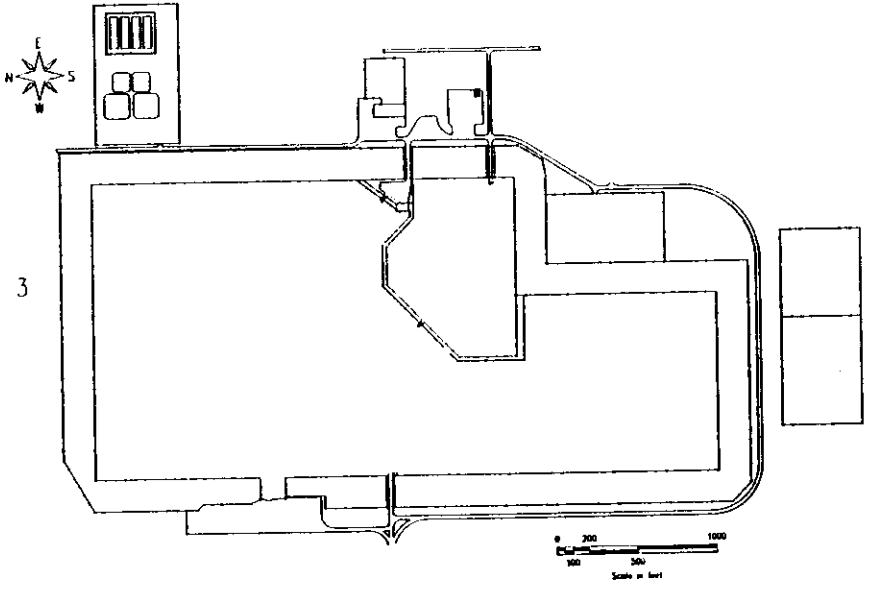
BK - 4

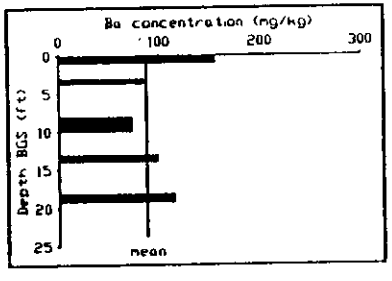


BK - 5

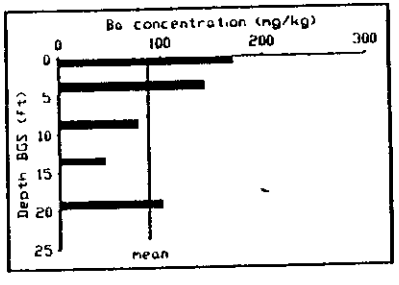
BK - 6







BK - 3



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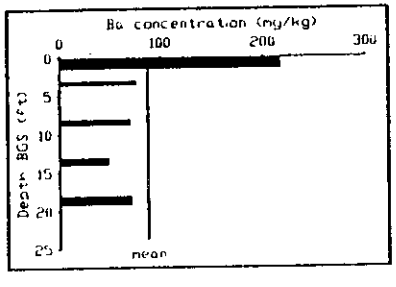
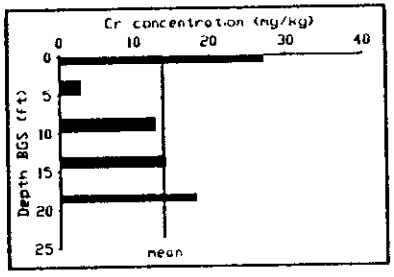


BK - 2

BARIUM CONCENTRATIONS
FOR THE ICPP ALLUVIUM



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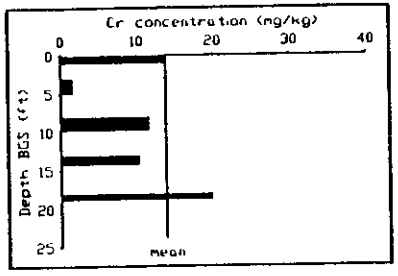
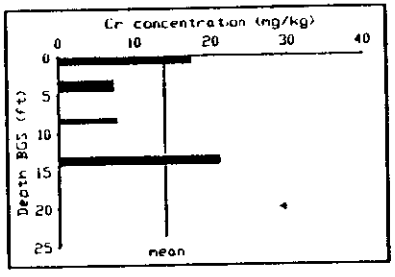
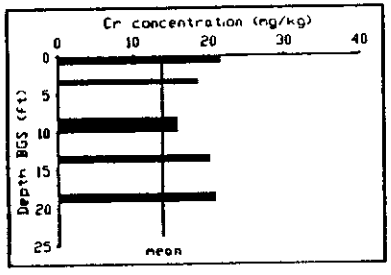


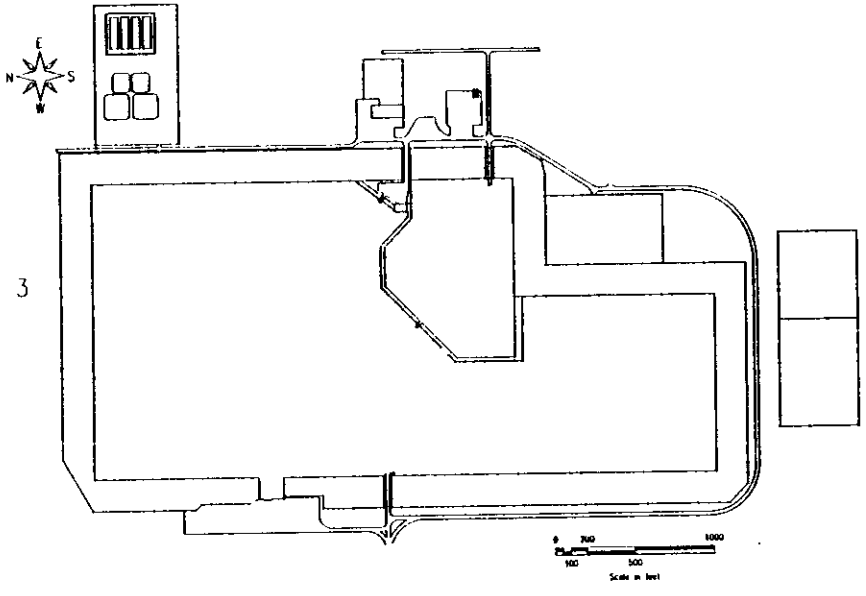
BK - 5

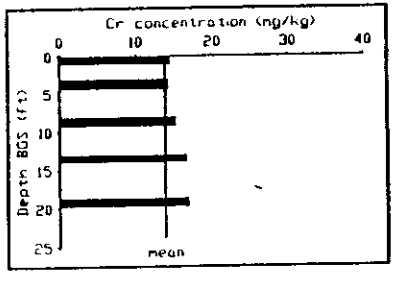
BK - 6



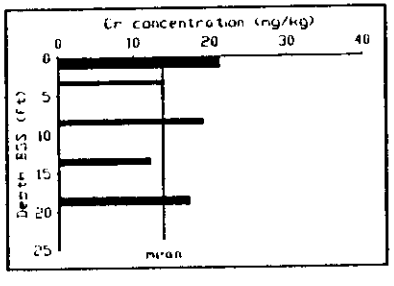


BK - 3



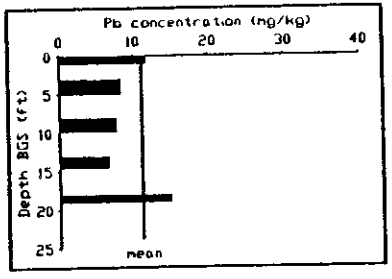


BK - 1

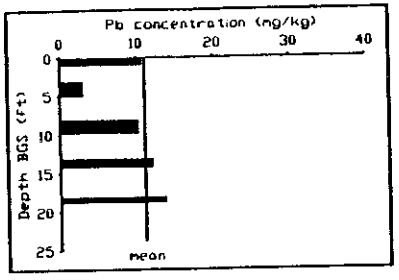


BK - 2

CHROMIUM CONCENTRATIONS
FOR THE ICPP ALLUVIUM

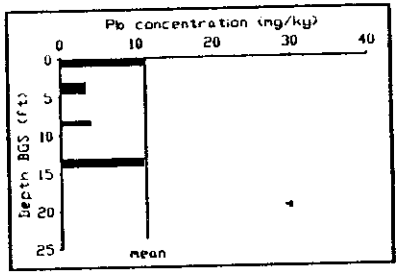


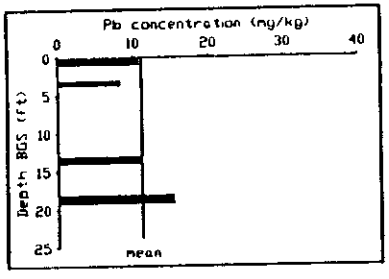
BK - 4



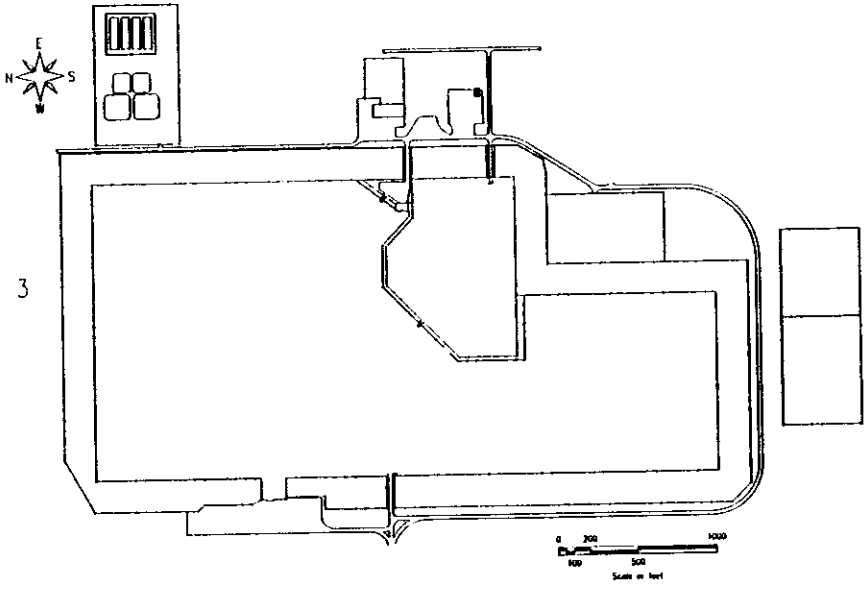
BK - 5

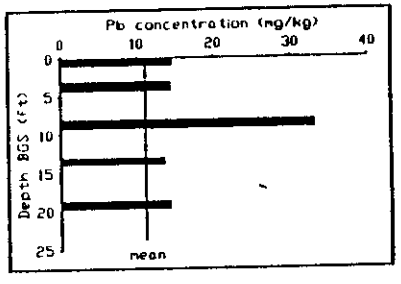
BK - 6



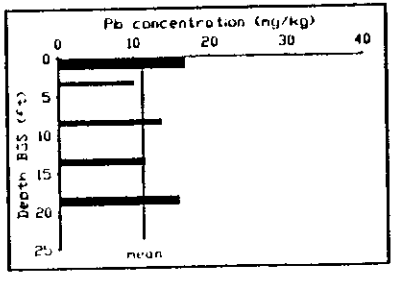


BK - 3



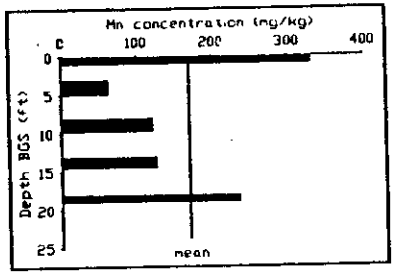


BK - 1

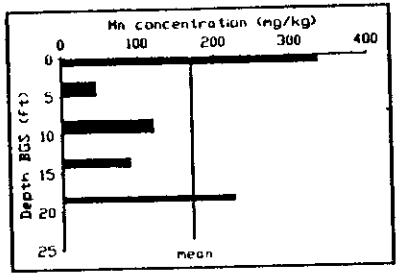


BK - 2

LEAD CONCENTRATIONS
FOR THE ICPP ALLUVIUM

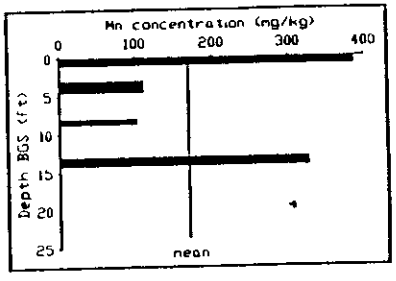


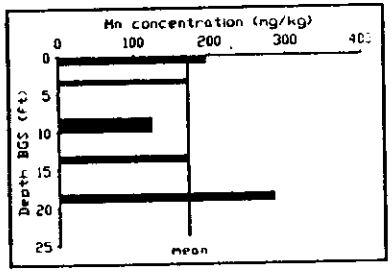
BK - 4



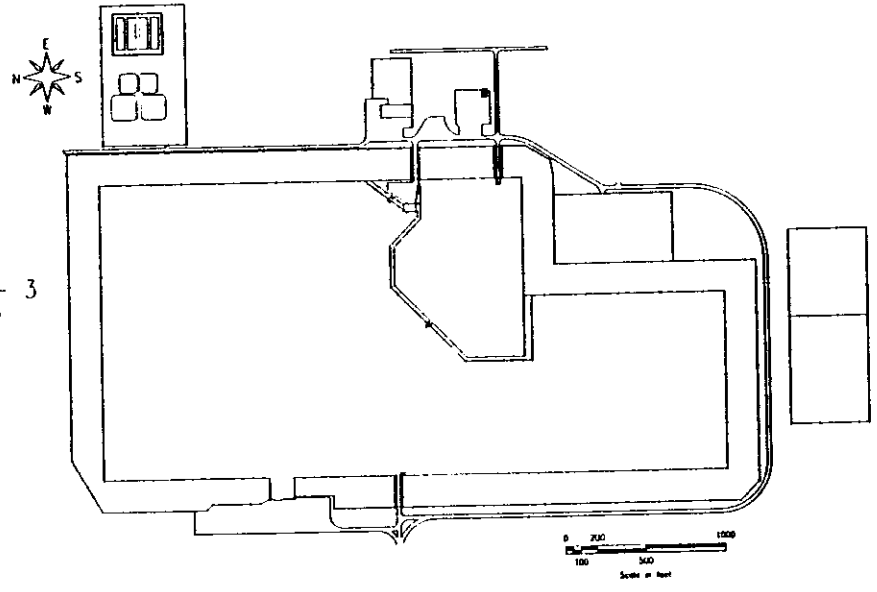
BK - 5

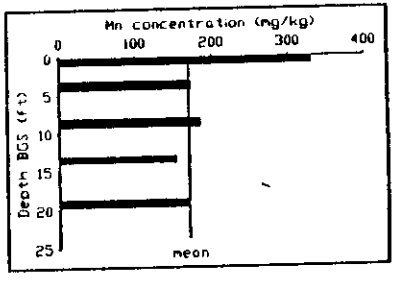
BK - 6



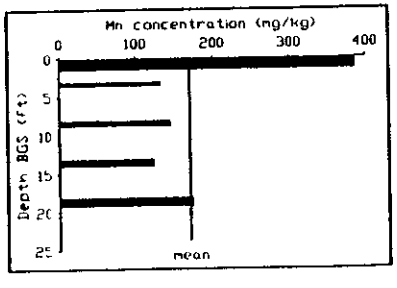


BK - 3



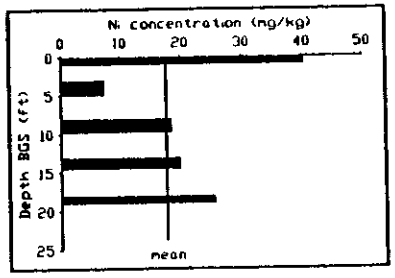


BK - 1

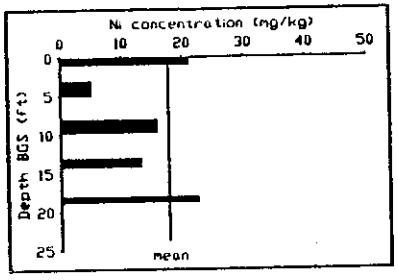


BK - 2

MANGANESE CONCENTRATIONS
FOR THE ICI?' ALLUVIUM

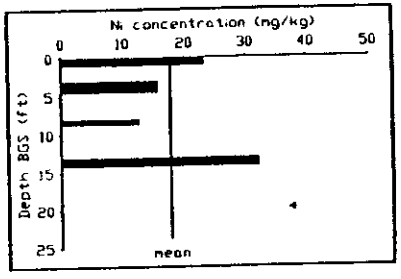


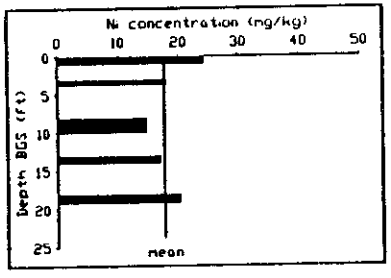
BK - 4



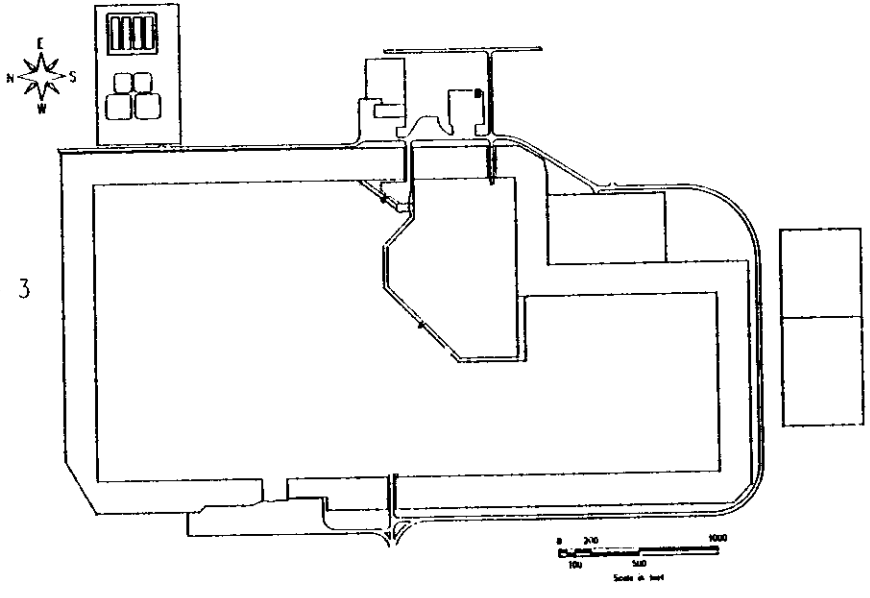
BK - 5

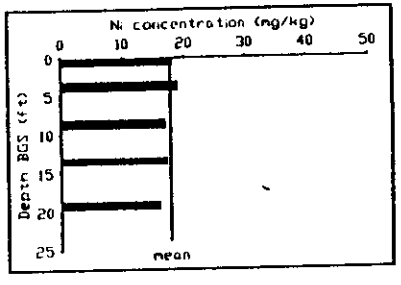
BK - 6



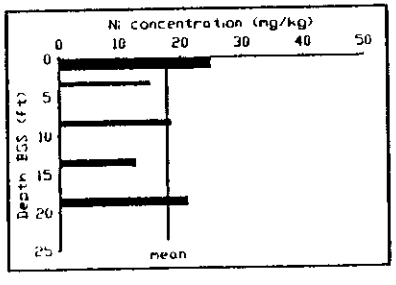


BK - 3



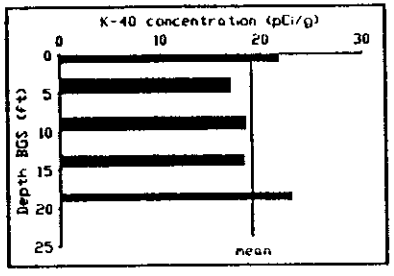


BK - 1

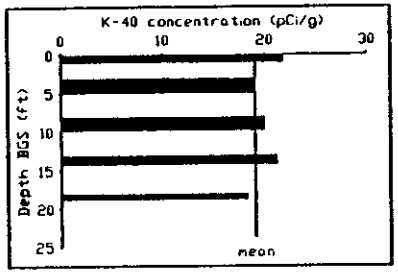


BK - 2

NICKEL CONCENTRATIONS
FOR THE ICPP ALLUVIUM

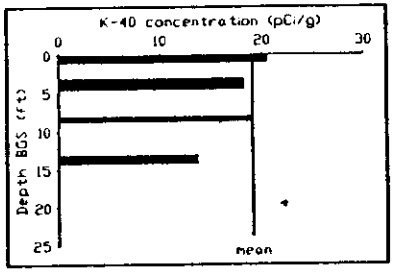


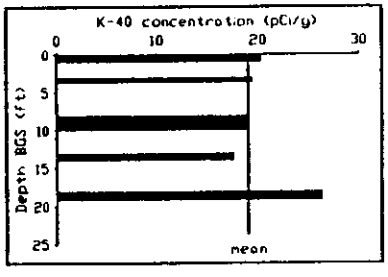
BK - 4



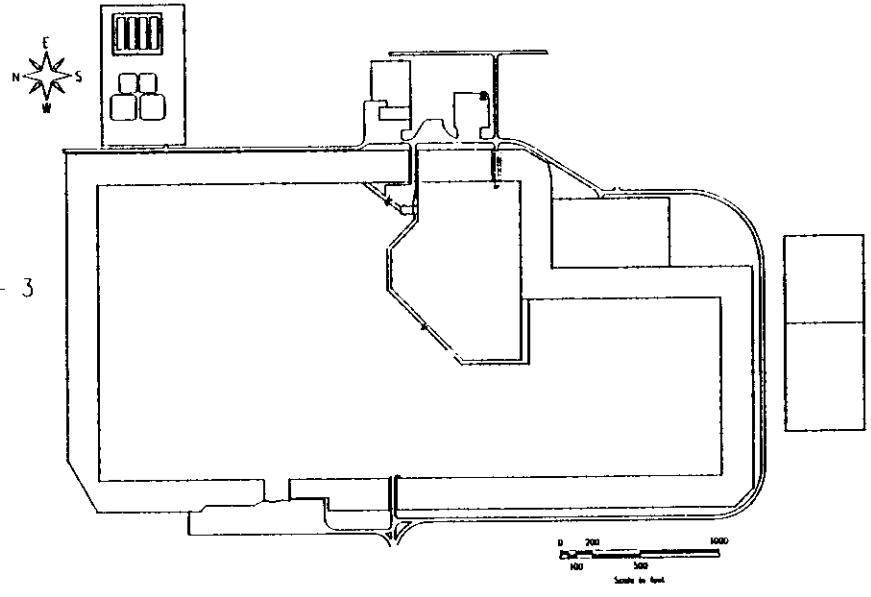
BK - 5

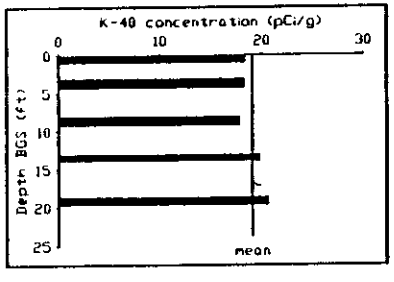
BK - 6



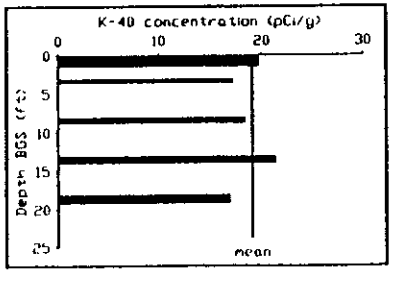


BK - 3



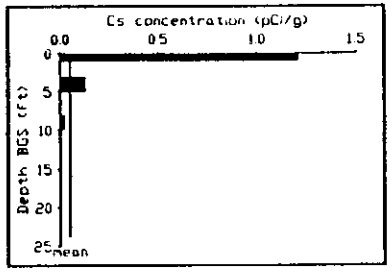


BK - 1

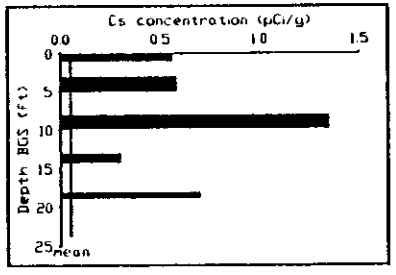


BK - 2

POTASSIUM-40 CONCENTRATIONS
FOR THE ICPP ALLUVIUM

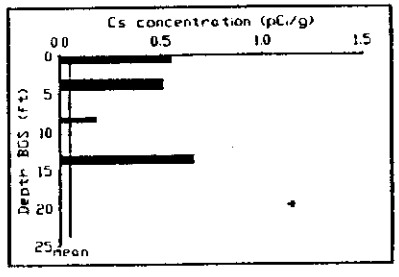


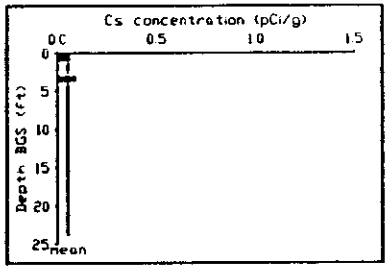
BK - 4



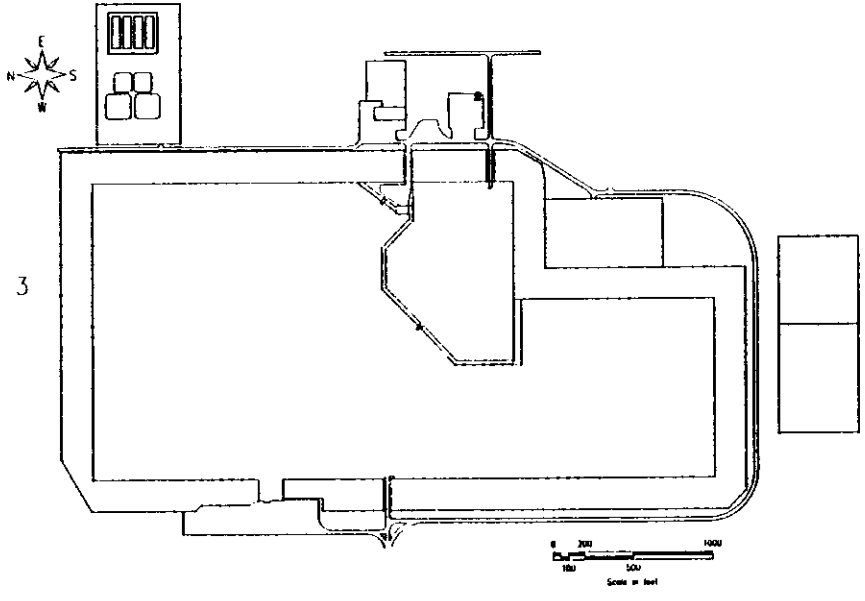
BK - 5

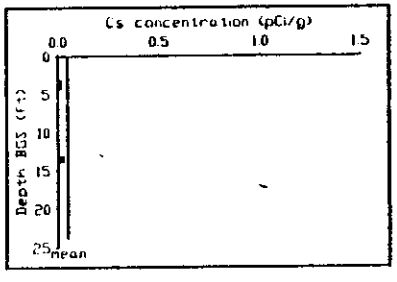
BK - 6



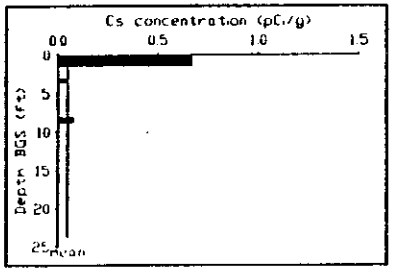


BK - 3



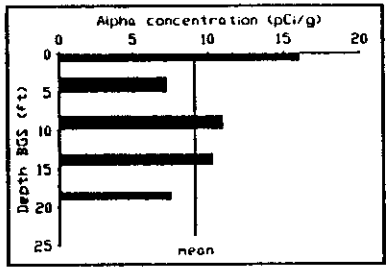


BK - 1

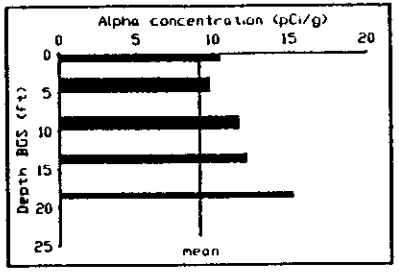


BK - 2

CESIUM-137 CONCENTRATIONS
FOR THE ICPP ALLUVIUM

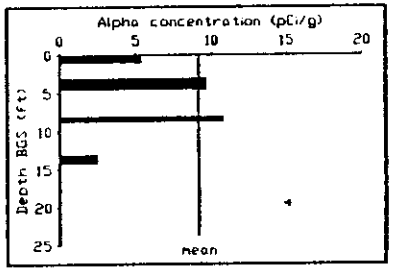


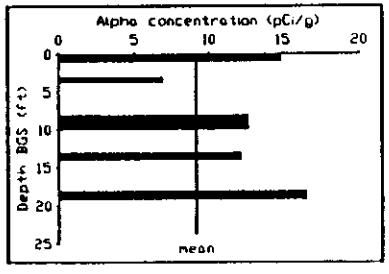
BK - 4



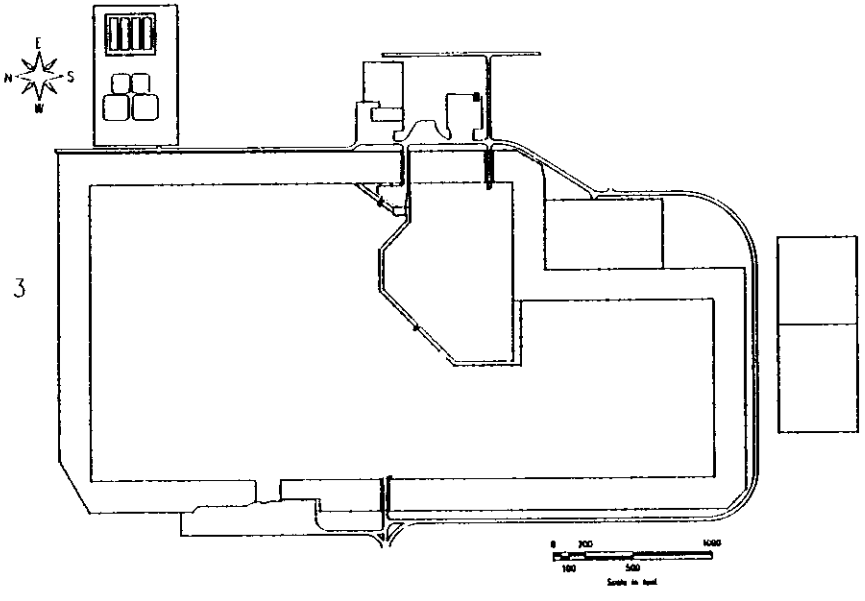
BK - 5

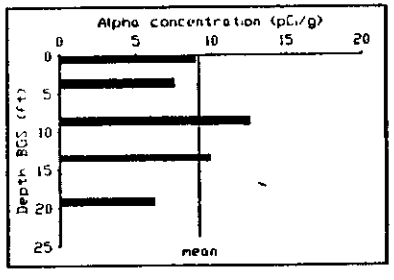
BK - 6



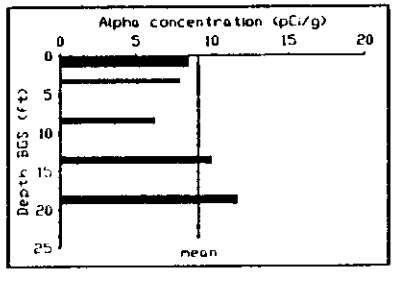


BK - 3



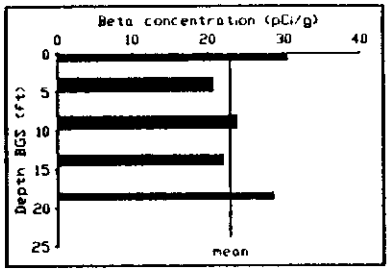


BK - 1

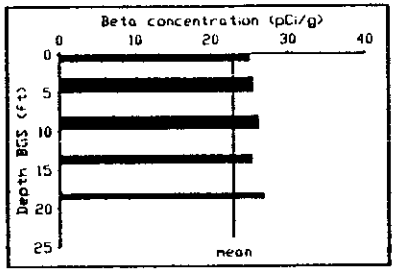


BK - 2

GROSS ALPHA CONCENTRATIONS
FOR THE ICPP ALLUVIUM

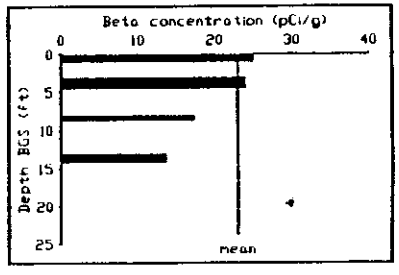


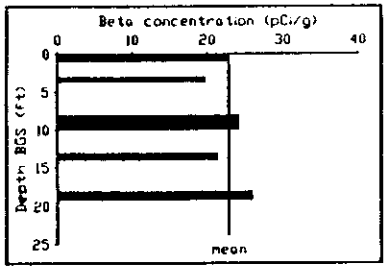
BK - 4



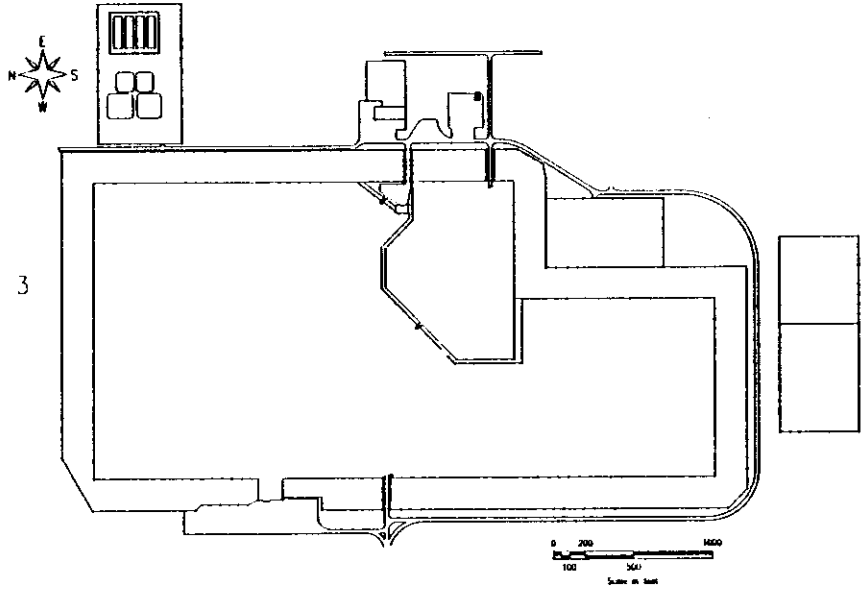
BK - 5

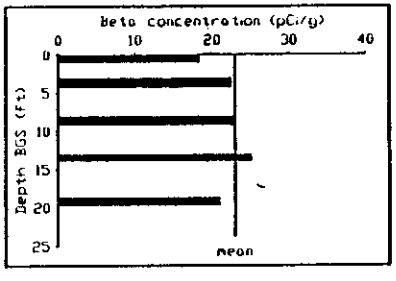
BK - 6



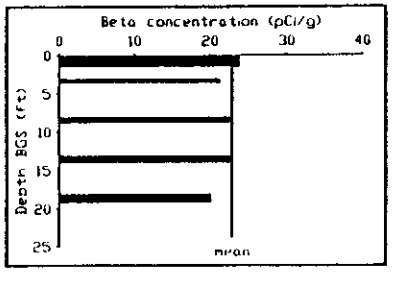


BK - 3





BK - 1



BK - 2

GROSS BETA CONCENTRATIONS
FOR THE ICPP ALLUVIUM